





# The Crunch for a phone phreak

"DO you know what a blanket party is? A blanket party is when you're jogging down the track in the prison yard and they throw a blanket over your head and they beat you, maybe to death — with clubs."

That is what John Draper learned in jail. What his fellow inmates learned from him is not clear, but they could have got an inside track on just how to rob the telephone system.

That is why Draper spent several months in the Federal minimum security prison at Lompoc, California: fraud by wire, Title 18, Section 1343, of the United States criminal code. His crime involved the use of an electronic device, commonly called a blue box to defeat the telephone system's billing apparatus.

What, if anything, Draper told the threatening and inquisitive inmates, including "three people who were ex-engineers," hardly matters.

The methods of the phone phreaks, as the people who like to beat the telephone system are called, are common enough knowledge. Thousands in the US are believed to be defrauding telephone companies, and only a handful are ever caught.

Some of the phone phreaks believe they are helping to destroy a pernicious Establishment, epitomised by the American Telephone and Telegraph Company.

TAP, a newsletter published by and for these technological guerrillas, affects a leftist-anarchist style. It has been available for \$5 per year simply by writing to Room 418, 152 West 42nd Street, New York, New York 10036.

While Draper is neither a hardened criminal nor a wild-eyed revolutionary, he did achieve quite a bit of notoriety under the name Captain Crunch.

Captain Crunch is a brand of caramel popcorn that once offered a free whistle in each box of candy. That whistle emitted a 2,800 Hz tone, coincidentally a signalling frequency used by AT&T's equipment.

A caller using certain long distance circuits could blow a Captain Crunch whistle and then pipe a sequence of other audio tones into the mouthpiece of any telephone to obtain a free call. John Draper has been credited with discovering the unusual properties of that tiny plastic whistle, hence his nom-de-guerre.

Of late, the US government has become very concerned about the activities of people like John Draper.

In addition to the public telephone network, phone phreaks have reportedly explored the separate but interconnected systems of the military, government agencies, and law enforcement authorities. All these systems are connected to computers.

Telephone access to computers by unauthorised persons jeopardises the security of criminal records systems, military personnel files and the dossiers kept by credit reporting agencies. Not only can a phone phreak gain remote access to such sensitive material; he can do so without leaving any trace of his clandestine activities.

"Phone phreaks" gear defeats the records left in the telephone system's billing apparatus," explained SRI International's computer crime expert, Donn Parker. These billing records may serve as the basis of other criminal charges, for example conspiracy.

A study of the US government's attempts to halt organised crime notes that of all the various charges filed against persons arrested by its special organised crime task forces, conspiracy was by far the most common. Thus the Mafia has a special interest in learning the methods of the phone phreaks.

In addition, Parker pointed out that other criminals have also succumbed to justice as a result of their telephone crimes while remaining immune from prosecution for other misdeeds. "Bernie Cornfield," says Parker, "might not be in jail today if he hadn't broken the law with a blue box." Cornfield for years ran the scandal-ridden financial organisation, Investors Overseas Services.

But Draper is not a hardened criminal. Both Parker, who has interviewed him, and Draper's attorney, Daniel Brookman of Los Angeles, have characterised Draper as rather simple and naive, despite his wizardry where telephones are concerned. In many ways, according to Brookman, Draper is typical of the phone phreaks.

Most are young, including many engineering students, and nearly all are far removed from the underworld. They attack the telephone system more for the challenge than for personal gain, according to a former university instructor.

## Germans launch a micro

GERMANY's only surviving general-purpose minicomputer, Dietz, has introduced a micro-computer code-compatible with the rest of its 621 line.

Called the Micro-621, the new machine has a processor built up from 2801 bit-slice micros, offered by AMD and Motorola, together with a programmable read-only memory which emu-

## LETTER FROM AMERICA

By Hesh Wiener

Brookman has had a great deal of experience with such persons, and actually has built up a significant practice in this unusual speciality.

He began this phase of his career when a friend was arrested for using a blue box in 1972. Brookman's defence was successful, and it led to his getting a number of clients with similar difficulties.

AT&T is reportedly devising ways of catching the phone phreaks these days, and that would help explain Brookman's observation that incidence of this crime peaked in 1974 or 1975.

The attorney believes that the legal tactics used to prosecute some phone phreaks are unconstitutional. The warrants used to obtain telephone records in attempts to establish a pattern of suspicious calls are, in his opinion, too vague and general.

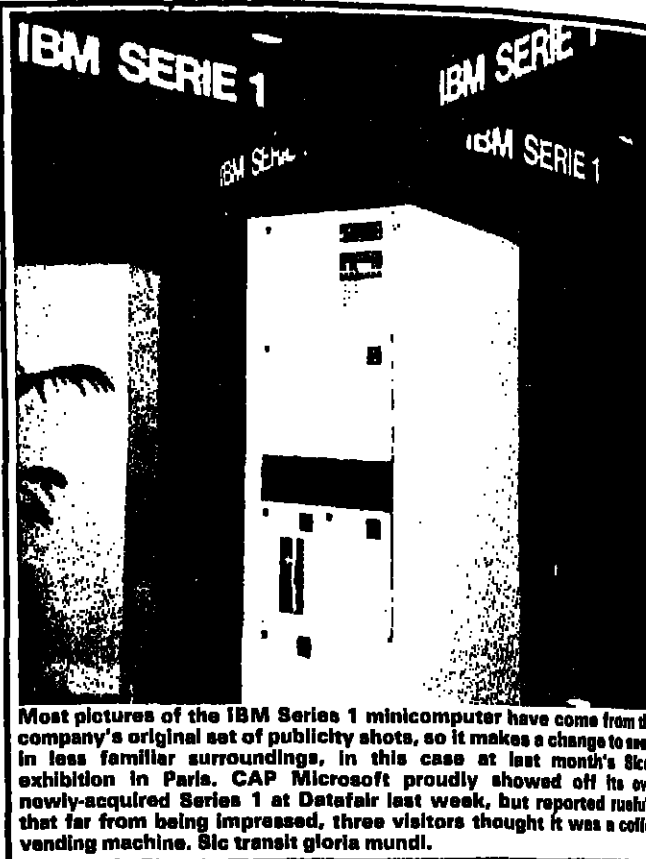
Brookman may feel that Draper, who served the army of phone phreaks as an anti-hero for a short while, is not a major criminal, but there are indications that the Federal Bureau of Investigation may feel otherwise.

A man who goes by the name of Chic Eder has reportedly befriended Draper. According to a source in the counterculture press, Chic Eder was a companion of the late comedian Lenny Bruce and may have been a paid informant involved in Bruce's arrest on narcotics charges. Draper might not be the object of an FBI investigation, but instead could be used as a pawn in some game to trap narcotics dealers or other criminals.

Draper, according to this hypothesis, could get caught in the trap, an unfortunate casualty, while Chic Eder bargains his way out by testifying for the prosecution.

For now, though, Draper is using his keen mind for beneficial purposes. He has designed a communications system for the personal computers made by California's Apple Computer Company.

That system will enable hobbyists to build networks of inexpensive computers and thereby exchange programs electronically or engage in long-distance computer tournaments.



Most pictures of the IBM Series 1 minicomputer have come from the company's original set of publicity shots, so it makes a change to see it in less familiar surroundings. In this case at last month's Sicob exhibition in Paris, CAP Microsoft proudly showed off its own newly-acquired Series 1 at Datafair last week, but reported truthfully that far from being impressed, three visitors thought it was a coffee vending machine. Sic transit gloria mundi.

## Systems house wins first big overseas order

SYSTEMS house Toltec Data, of Cambridge, has received its first large overseas order, for a disc unit and software to enhance a microprocessor-based data collection system at the Max Planck medical research institute in Heidelberg, West Germany.

The institute's system, based on a Computer Automation Alpha LSI-2 processor, takes data from analytical instruments and performs some pre-processing on it before putting it on magnetic tape for further mainframe processing.

Toltec has supplied one of its own packaged twin floppy disc subsystems for attachment to the LSI-2. At the same time, Toltec has sold a copy of the

## Air reservations agreement

WITH Iranair's 370/158 based reservations system (CWI, July 3, 1975), due to go live in November in Teheran, the Royal Dutch Airline, KLM, which has been helping Iranair with its implementation, has just signed a similar agreement with Pakistan International Airlines, PIA.

Like Iranair, PIA will run KLM's Computerised Reservations Royal Dutch Airlines, Corda, system but unlike Iranair PIA will not use Corda on KLM's

Interactive-16 software, which provides interactive editing a disc operating system, file management software, a Fortran compiler, loader, library program and disc utilities. Interactive-16 was originally developed at Cambridge University.

Unlike many companies selling hardware and software products, Toltec intends to manage all European sales itself. This will be achieved without a permanent base, by sending members of staff periodically to the countries concerned, "to keep an eye on our installations, or to advise on new ones," says managing director Paul Reeve.

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## Jim Palmer's camera eye-view of some of the latest products at Sicob

### CII-HB policy for Level 6/30 and 6/40 minis

BIG news from CII-Honeywell Bull at Sicob in Paris was that the company is to build the Level 6/30 and 6/40 minicomputers at its Angers factory and sell them into the OEM market.

The company's attractive stand was laid out as a "company village," with applications for the bank, the Post Office, the Mayor's office and so forth. The three young ladies, pictured right, wearing the very fetching cheesecloth dresses chosen by the French company this year, were located in the Syndicat d'Initiative booth.

The French government has just announced its provisions for support of CII-Honeywell Bull in the 1978 budget. The total sum being set aside is 500 million francs (284 million). This is broken down into 285 million francs as a direct subvention under the four-year support plan; 35 million francs as the State's contribution to a planned increase in CII-HB's share capital in 1978; 140 million francs which does not go to CII-HB but to the companies which have taken over some of the activities of the former CII;



and 80 million francs against a possible shortfall in the orders promised by the state to CII-HB.

Public sector orders fell only 4% short of the promised figure in the year to March, 1977, and the government hopes that the 60 million will not be required. The commitment is to give the

company 55% of the value of any shortfall in the planned level of public sector business.

## French debut

CLAIMED by Olivetti to be the only desk-top computer of its size and capacity programmable in a high-level language, the P8040 (pictured right) made its French debut at Sicob. It sells for about £2,000, and includes a 16 column printer also used in Olivetti's calculators, a strip display for operator guidance, has a 3 in diameter 3K-byte disc for data storage and program entry, and is programmed in mini-Basic. Packages are available for civil engineering and statistics.



## Datsaab accent on comfort

ONE of the most notable features of the new Datsaab 16/30 workstation - oriented business system is the specially-designed display terminal, shown below.



## Commodore's PET

This is Commodore's PET. And in case anyone gets the wrong idea, PET stands for Personal Electronic Transactor. The desk-top machine is designed for the domestic market, and for professional people who want an accounting system as well as something on which to play computer games. Based on the MOS Technology 6502 micro and programmed in the Moon, the PET was set up to test Sicob visitors' skill at juggling a module of Commodore hopes to sell it for about £800 when European markets open next year.

## Cornerstone of the Mael line

IN previous years, Insel of Italy has exhibited at Sicob under the name of a distributor, Cigec, but this year the company showed its Mael 1000, 2000 and 4000 systems under its own name.

The company now plans to set up its own subsidiary, which will market the product line in the Paris area, but it is looking for distributors interested in selling in the French regions.

Cornerstone of the Mael product line is the Mael 2000, seen here with Sergio Rocco, one of its principal designers.

The powerful business system is at present based on the Fairchild F8 micro.

"It is not a microprogrammed machine, and we don't want to be tied to one micro," says Signor Rocco. "The F8 is a 2 microsecond cycle device, and we are planning to switch to a 500 nanosecond 18-bit micro, but we have not yet decided which it will be."

Insel uses a proprietary macro language which is



interpreted rather than compiled, and the interpreter takes 16K-bytes of memory, leaving 48K-bytes for the user.

There is an assembler with a control source generator program, and facilities include a sort language, an index sequential package and the ability to use formats of any length.

"You can move 4K-bytes in one macro-instruction," commented Rocco.

A useful facility is the 1K diagnostic program, which is supplied to the user on a floppy disc, so that he can check out his own machine.

The 2000 processor, also used on the 1000 key-to-floppy disc system, is being developed to cover the power of the larger but older Mael 4000, and data format compatibility will be retained.

Double-density double-sided floppy discs will be introduced on the 2000 next year, and software is organised in the same way on both floppy and hard discs.

Insel did 3,500 million lire worth of business (about £2.3 million) last year, and hopes to double it this year. About 70% of its business is outside Italy, with Germany the largest market and the UK second through its agreement with Computer Ancillaries. It is active in Holland and looking to do business with the Portuguese government.

A major project is under way with Bank Mellat to design back-office banking systems based on the Mael 4000. The contract was won in competition with IBM, NCR, Burroughs and Honeywell.

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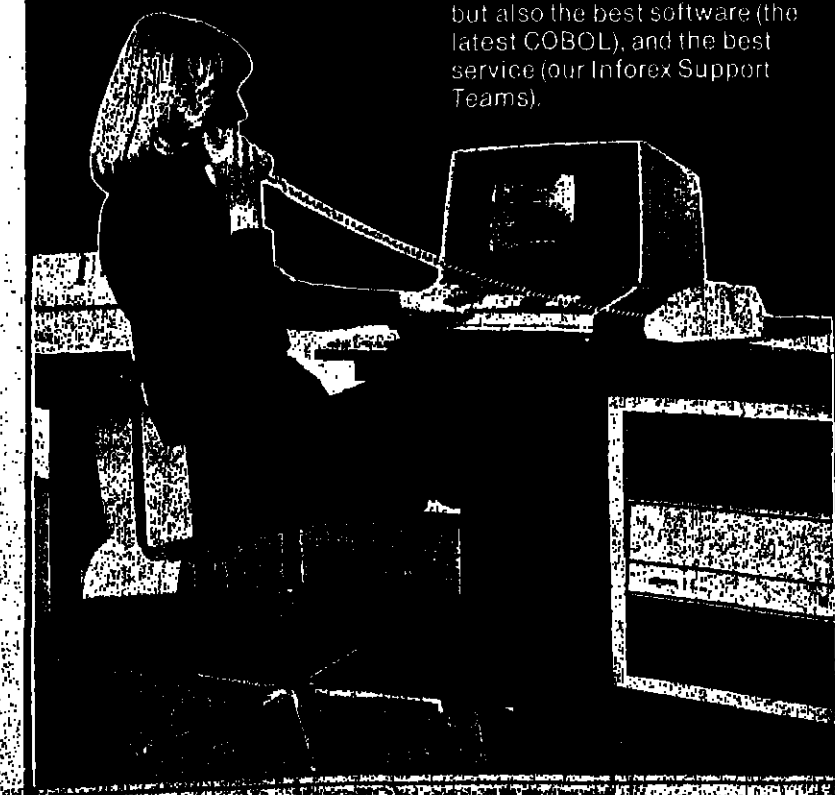
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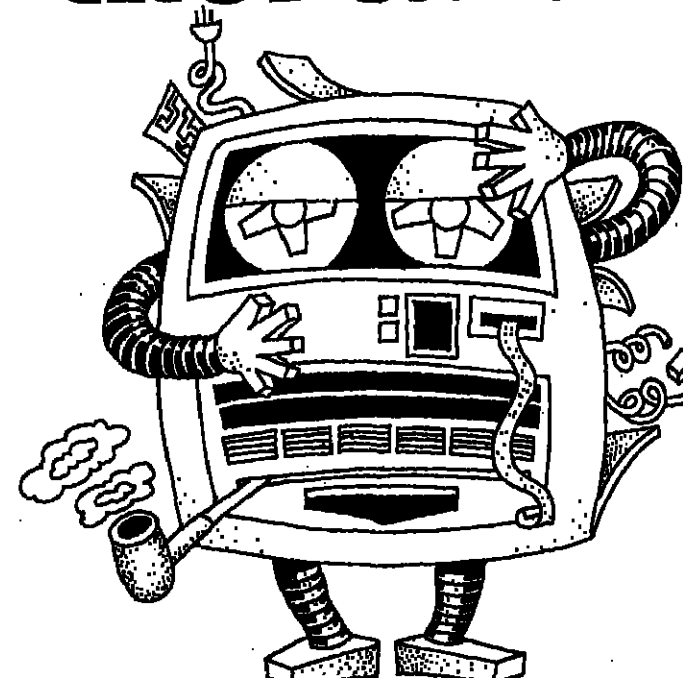
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## MARKETVIEW

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invasions. Dull black and white print, unrelieved by the slightest illumination, an offence to the human spirit." If any friar made such a speech five centuries ago — and there were probably several up and down Europe — he would have had a point. Printing has taken most

of the art and joy out of manuscript reproduction. Yet who, today, would be prepared to get up and say that the invention of the printing press had been a bad thing? Take away the advertising, the pornography, the cheap sensationalism, that between

them represent a large part of what comes off the world's printing presses these days, and you are still left with a greater output of the world's great literature, a greater dissemination of art and scientific knowledge than could ever have been dreamed of in the days of hand

SUPPORTERS of Professor Dijkstra's micro attack now disclaim any intention of halting progress, and claim only to be concerned at poor microprocessor design.

The arguments currently expressed against the poor design of micros would be more convincing if the academic attack on microprocessor design had occurred when these defects were most glaring: five years ago. For microprocessors have not been with us for almost ten years, developed originally for the microminilabour computers required on NASA's lunar landing module. They began to appear on the civilian DP market around 1968, but at first only to special order from large mainframe, minicomputer, and intelligent terminal manufacturers.

LSI component manufacturing techniques feature negligible unit production costs, but very high mask design and tooling up costs. So it is only on very long runs that any LSI component can be produced cheaply. If LSI microprocessors had continued to be manufactured only to special order, only the largest manufacturers could have afforded them, and the tendency of the computer industry to be dominated by an ever smaller number of larger suppliers would have been reinforced.

The first manufacturer to try to base a challenge to the computer industry's establishment on mass production of a cheap LSI microprocessor-based distributed processing terminal was Viatron in 1968. But Viatron was before its time, had underestimated the lead time before any LSI mask starts producing

### QUOTE

What has happened in the last 12 months to disturb professors of computing and DP managers that had not been even truer at any time in the previous five years? Only one thing: the advent of the microprocessor-based \$200 DIY computer kit, and the \$600 fully programmable and packaged personal computer during 1976.

satisfactory yields, and was hit by a cash flow crisis just when US capital for speculative computer ventures was drying up in the 1970-1971 recession.

Thereafter, LSI microprocessor-based terminal and other processors would have remained the privilege of the largest manufacturers if Intel had not led other LSI component manufacturers in designing general purpose LSI microprocessors that could achieve the economies of very long runs, and yet be sold at moderate cost to large numbers of different manufacturers and systems houses of all sizes in not too large quantities.

Intel, Motorola, National Semiconductor and all the other microprocessor manufacturers are primarily LSI component manufacturers with electronic rather than computer expertise. Inevitably it was their primarily electronics-oriented designers who designed the first general-purpose, as distinct from special order, microprocessors. Their first designs certainly showed these limitations, notably the 4-bit word Intel 4004 of 1971 used mainly in pocket of calculators, and the 8-bit word Intel 8008 that appeared on the market in July 1972 and was the first to make an impact on the EDP industry.

As 8-bit parallel processing

## Why academics are only now attacking micros

was all that could be integrated on a single chip at the time, and multivord instructions were at first regarded as too complicated to design, the 8008 order code was entirely based on single-word 8-bit instructions. In these, no more than three bits could be spared for operand addresses, allowing no more than 8 registers of 8 bits to be addressed. Larger main memories had to be addressed indirectly via addresses stored in two chained H (high order) and L (low order) address registers. But what do you do when an interrupt occurs and you want to preserve the current contents of all registers in main memory backup locations? How do you address those backup locations, without thereby corrupting the existing contents of the H and L registers?

All this, however, was five years ago. And it took less than nine months for a small French systems house, R2E, to discover a way around the Intel 8008 register preservation problem: connect a pushdown stack buffer to one of the eight I/O channels, and preserve the contents of all eight registers (including the H and L registers) on interrupt by a sequence of eight OUT instructions. Fifteenth months after that, in July, 1974, Intel itself announced the 8080 microprocessor with a much enriched order code, that includes many two and three word instructions with 16-bit address fields that allow up to 64K bytes to be addressed directly by the relevant instructions: as many as on the original IBM 360/30, four times more than on the erstwhile IBM 1401 that had been the workhorse of the EDP world as little as ten years previously.

Maybe the Intel 8080's order code, and that of the competing Motorola M6800 and Zilog Z-80, are still not ideal for the compilation of high-level languages. But then, neither are the IBM 370 and DEC PDP-11 order codes. Nonetheless the Intel 8080 has almost from the beginning been programmable in a PL/I subset, albeit via an IBM 370 cross-compiler, and large configurations now support also a resident Basic interpreter. Maybe Basic is not the best high-level language on which to standardise, but its widespread adoption cannot be laid at the door of micros.

Nor are microprocessors standing still in the range of high-level languages that they offer. CAP-Microsoft has developed the portable Micro-Cobol compiler for all and any micros, as well as the Micro-ADE debugging package. Other languages will doubtless follow.

So with general purpose LSI microprocessors available on the civilian DP market for the last five years, and most of the deficiencies of the earlier designs corrected as long as three years ago, why are academics attacking microprocessors only now?

What has happened in the last 12 months to disturb professors of computing and DP managers, that had not already been even truer at any time in the previous five years? Only one thing: the

advent of the microprocessor-based \$200 DIY computer kit and the \$600 fully programmable and packaged personal computer during 1976.

Until then, the ever cheaper LSI microprocessors had been bought mainly by manufacturers of traditional computer equipment. They had allowed a growing number of small terminal manufacturers and systems houses to undermine the domination of the DP market by

IBM and other large mainframe manufacturers, but their products were still aimed primarily at the DP professional.

With the DIY computer kit and the \$600 personal computer, we face a completely different product: one that bypasses the DP professional to appeal directly to the layman. So one is driven to the conclusion that it is this appeal to non-DP laymen by a specific application of microprocessors, rather than any

long standing but diminishing deficiencies in their order codes and software debugging tools, that are the real targets for Professor Dijkstra's attack and the response it has elicited among so many DP professionals.

Even so, it is at first sight difficult to see why the activities of hobby programmers should be regarded as a threat by DP professionals. Walking around the Personal Computing Fair at



Fred Lamond

last June's NCC in Dallas, it seemed that no more than one DIY computer user in ten had apparently moved beyond game-playing applications to program a common-or-garden

● Turn to Page 31



## The international sign for desk-top computing

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copying of manuscripts. Above all, it turned reading and writing gradually from being the privilege of a small élite into the birthright of every man, woman and child, however poor and humble. That, of course, made it a painful development for those who had made a

I SUSPECT that behind all the overt concern for protecting the innocent from DIY fools lies a deeper and far more rational fear: that the personal computer is about to invade the large corporation's head office, and destroy once and for all the DP department's control over its users' computing activities.

The centralised DP department's position had already begun to be undermined before the advent of the microprocessor-based personal computer by distributed minicomputers.

The number of dedicated applications implemented on minis has grown faster in the last five years, even in large corporate headquarters, than the number of applications on central mainframes. That is why the business minicomputer market is booming, whereas the medium size DP mainframe

living out of being among the few who could read and write. It deprived monasteries of much of their social usefulness, and thus led to their abolition in Northern European countries a century later. But they survived elsewhere, and made up for the drying up of demand for their

## The promise of a better informed democracy

market growth curve shows signs of flattening towards becoming purely a replacement demand for ageing systems.

More recently, some radical managements have ordered minis to replace their central mainframes entirely.

As long as the distributed processing challenge came only from minicomputers, however, it could be contained. Minis may be much cheaper than medium size mainframes, but at £20,000

to £100,000 each they still represent quite substantial slices of investment. This is not the sort of investment that any large corporation's department can undertake surreptitiously without top level approval.

And when such top level approval has been sought, central DP departments have frequently been able to put a stop to it.

Even when central DP departments have been unable to stop distributed processing on

free standing minis entirely, or have been too intelligent to try, they have generally been able to retain control of file and record formats to ensure compatibility with a central database, and to put themselves forward as database managers and corporate DP consultants to the various distributed user departments.

The increasingly cheap personal computers threaten to change all that, and to weight the scales overwhelmingly on

the side of distributed processing.

Once the cost of personal computers starts dropping below \$500, many middle-level executives will start getting these as Christmas presents, and some will bring them into their offices. Even when executives are not prepared to pay themselves for computers to do their office work, a \$500 personal computer can easily be hidden under "sundry office equipment" much more easily than a \$50,000 minicomputer. So it looks as if the distributed processing trickle of determined user departments wishing to be independent of central control is about to become a flood.

Whether the growing numbers of personal computers that are going to be used throughout large corporations from now on are completely programmed or not will depend in no small measure on the attitudes of the traditional DP departments. If they co-operate with the trend, they will be able to pass their accumulated experience down to the user departments. If they try and act like Canute, the user departments will have to act surreptitiously and reinvent the wheel by learning from their own mistakes.

Not all the standards to which central DP departments have been working will be relevant to the needs of the new distributed processing operations. Code optimisation, for instance, will matter less and less the cheaper computer processors and their main memories become. Modular programming will remain relevant as a technique for saving on software development costs, by allowing as many programs as possible to share common processing sub-routines. But its use in the organisation of overlays will be much less important in small single program personal and office computers, compared with multiprogramming environments to optimise the use of expensive centralised mainframes.

Does all this really represent a leap back 25 years? Surely documentation standards, modular programming, and the other disciplines developed by Professor Dijkstra and other

professors of his standing are but tools to get the work done. If cheaper hardware tools have now become available that make some of an earlier generation's software tools less relevant, does this matter as long as the practical jobs for which computers are employed get done more efficiently and more cheaply than ever before?

Whatever happens in the future to Professor Dijkstra's standards, there are in any case two respects in which the advent of the microprocessor-based personal computer are quite unmixing blessings. Both stem from the fact that they will spread knowledge and experience of programming logic and methods much more widely throughout the community.

The first is that they will help overcome the bottleneck in software skills that is generally acknowledged to be the greatest brake on the more widespread use of computers, notably in industry. Among the growing number of computer buffs who will acquire DIY computer kits or fully packaged personal computers will be many engineers and workers in non-automated industries.

Once they have mastered computer programming techniques, their thoughts will turn naturally to their application in their own industries that they know well. The 1980s may thus see a much swifter advance in automating dull and repetitive unskilled jobs than has happened hitherto: not just because the processors and their memories are becoming ever cheaper, but because their application to each problem will come increasingly from within each industry itself, instead of being promoted primarily by computer salesmen and systems houses.

The other aspect is the much wider access to social, economic and scientific databases that a more widespread knowledge of computer programming and manipulation techniques will allow. Knowledge is power. The more the knowledge contained in computerised databases is accessible to the widest range of people, the more informed our democracies will be, and the safer everyone's freedom will be.

The abolition of drudgery and a better informed democracy than ever before. That is the promise of microprocessors and the personal computers based on them over the next ten years. How could that be a leap back 25 years?

## Academics' attack

● From Page 30

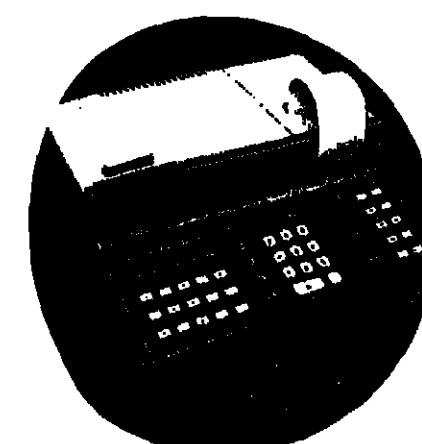
invoking and tax return package for his neighbouring stores. Does it really matter whether these hobby programs follow all Professor Dijkstra's principles of modular programming and good documentation?

If a hobbyist cannot amend his thoughts-and-crosses game program because he did not document it properly, and therefore has to start again from scratch, surely that's all part of the fun of learning.

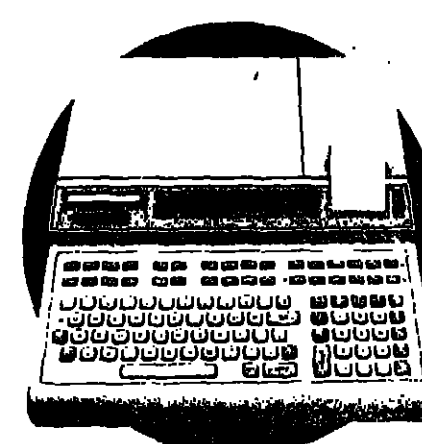
Some DP professionals seem to worry that, time after a while, their other games, computer services to you for his references, and contact, them, before signing any contract or packing with any money in advance of delivery.

Disaster will follow all too frequently from their ill-planned, ill-executed and ill-documented endeavours, and computers and the whole computer professions will be brought into disrepute.

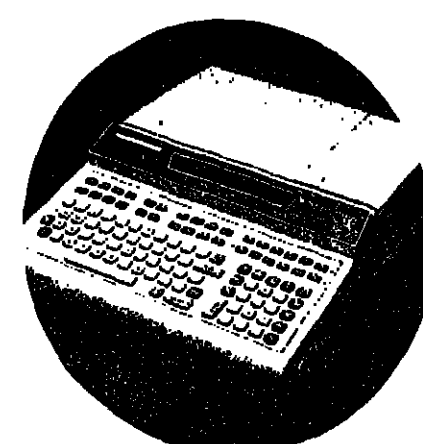
This does indeed happen, but it is hardly a new phenomenon. There have always been and will always be computer quacks, just as there are medical quacks, crooked solicitors, dishonest accountants. And there is a well-known method for guarding against them in any walk of life: ask any little or unknown person who offers his professional services to you for his references, and contact, them, before signing any contract or packing with any money in advance of delivery.



HP 9815. Internal memory to 2000 steps—plus built-in 96K byte data cartridge. RPN logic and simple machine language. Many pre-programmed maths and stat functions. Comprehensive editing keys, alphanumeric display and printer.



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## FUTUREVIEW

How relevant are the ideas of science fiction authors — that rare breed of human beings who are paid by their fellow men to write about the future — to planning and predicting the course of science and technology? How, in particular, does science fiction view the future of computers? In this special Futureview interview, psychologist and computer scientist Dr Chris Evans talks to a fellow scientist, Dr Isaac Asimov.

Asimov, described as the world's greatest SF author, has written prolifically on both science fact and fiction, and is credited with inventing the concept of robotics. In his own words, he "outlawed the old-fashioned robot stories from the pages of respectable science fiction." He was also the first writer to define rules which robots must follow when they become an integral part of our lives. These are "Asimov's Three Laws of Robotics."

EVANS: Before discussing future developments in computer technology — robots, artificial intelligence and so on — I'd like to ask how you feel about the usefulness of science fiction in a general sense. Does it have any real predictive value, or is it just superior entertainment?

ASIMOV: Well, let's look at it this way: science fiction deals with the response of human beings to changes in the level of science and technology. It is the only form of literature which routinely deals with change and which assumes that the society of the future will be different from the society of today. The

difference may be for the better or for the worse, but it will be different.

Now this is important because there is no other form of literature that deals specifically with change. In ancient times, or even in relatively recent times, when people wrote about the future there was no real notion of change. Any future society was assumed to be just like the present one.

It was only with the establishment of the Industrial Revolution in Great Britain towards the end of the 18th Century and the beginning of the 19th, that for the first time

the rate of change within a society became fast enough for an individual to observe it in his own lifetime.

And that meant the birth of a new curiosity, because until then people had not really worried about what the future would be like.

Now of course this brand new curiosity had to be fulfilled, and in order to fulfil it people tried with varying success to imagine what the future would be like. And thus science fiction was born.

Now the important thing is that the rate of change has continued to increase very

rapidly, and today we are living at a time when mankind is in a state of deep, deep trouble.

Unless we can somehow anticipate the changes to come and order our lives in such a way that we can take advantage of them for the good of man, and not allow them to work for the bad of man, we are simply not going to survive.

It's for this reason that I think that science fiction is of tremendous importance because it is the only form of literature which gets people accustomed to the inevitability of change.

By the way, I think that all futurists, or at least those who are any good at all, have at some time in their life been interested in science fiction.

I do not think it is possible that anyone can be truly interested in the future and never have been interested in science fiction.

Evans: Your own science fiction has ranged very widely over a mass of technological possibilities and a mass of exciting and frightening futures. As far as I am concerned, no doubt because of my own involvement in computer science and my passionate interest in its various possible futures, I have always been fascinated by your own computer and cybernetic stories — in particular the "I ROBOT" series. It always comes as a bit of a surprise on re-reading them to see that you wrote them way back in the very early days of computing science, at a time when only the most adventurous and uninhibited computer scientists were thinking about such things as the ethics of building robots with "personalities", or computers with intelligence.

Asimov: Yes, now you see this is an interesting point because one would think that I wrote the stories because I had some insight into computer technology and could see further than even the computer technologists themselves. Nothing could be further than the truth, because when I first started writing my Robot series, back in 1939, it was before Vannevar Bush had put up his first all-electronic computer.

I had no knowledge whatsoever of computers, and I never did have until after the war, by which time the various Robot stories and "I ROBOT" had all been written.

Actually, they came not from anything that was done in science but from the previous history of science fiction. Robots had been a staple of earlier science fiction, but they had almost always been there in the form that had started with Mary Shelley's "Frankenstein."

In this concept the robot was a monster, a soulless piece of life which had been produced by a scientist who should never have done it.

A scientist was defying God by taking over a God-like function, producing life, and was therefore fittingly punished when the robot turned against him and had to be destroyed. It's the Sorcerer's Apprentice theme all over again.

Well, I grew tired of that plot and felt that it would be interesting if I could treat robots not as examples of scientists defying the gods, but just as engineering devices which, like any other engineering devices, would have to have built-in safeguards. That was the important thing, the safeguards to prevent what I call the Frankenstein syndrome. And so after a while I crystallised these into what I called the Three Laws of Robotics.

In the very first robot story I made reference to the fact that robots were built in such a way that they could never turn on human beings — their creators.

In a scene from the 20th Century Fox release "Star Wars" is C3PO (See-Threepio) one of the two extra-terrestrial robot characters.

But by the fourth story I had actually fully defined the Three Laws and they of course have been a staple of my stories ever since.

It is these three laws I think that made my robot stories different from any others, and in fact outlived the old-fashioned robot stories from the pages of respectable science fiction.

Evans: I wonder how valid the three laws will turn out to be when computers or robots reach the point where we will need to apply them. Could you state them in order?

Asimov: The first is, A robot may not harm a human being or through inaction allow a human being to come to harm. The second law is that a robot must obey the orders given it by human beings, except when such orders would conflict with the first law. The third law is that a robot must protect its own existence, except where that would conflict with the first or second laws.

Evans: And the "I ROBOT" stories were really permutations of the difficulties that might arise where robots were forced, in juggling with the respective merits of these laws for one reason or another.

Asimov: Yes, the laws are sufficiently ambiguous so that you can consider ways in which they might fail to cope with real life occurrences. At the start, needless to say, I began with rather trivial difficulties or paradoxes, but as time went on I was more or less forced into a deeper philosophical consideration of what the laws actually meant.

Of course I knew from the beginning that there was one particular rock on which all three laws could founder — if the circumstances arose. And that was tied up with the fundamental question: what is a mind? In other words, what is it that a robot must obey?

How does one know for sure that a man is not a robot, or a robot is not a man? And how does the robot know

what matter have on which to base his mind? Now I take this puzzle up in "I, Robot" because I didn't want to be sure what I was doing with it and how to do it.

Recently, when one of my magazines asked me to write a story, I figured out a way to do that would be a question of how to do it.

There's a story called "That Mindful of Him". It's a story of course, is the question. "What is the question?" You are mindful of him.

One of the story is that a man is told that they have to be replaced by a machine. He is told that they have to be replaced by a machine.

At this point they are being replaced by a machine. They are being replaced by a machine.

They are being replaced by a machine. They are being replaced by a machine.

They are being replaced by a machine. They are being replaced by a machine.

- Asimov's three laws of robotics: 1.—A robot may not harm a human being or through inaction allow a human being to come to harm.  
2.—A robot must obey the orders given it by human beings except when such orders would conflict with the first law.  
3.—A robot must protect its own existence, except where that would conflict with the first or second laws.

# How robots will develop into mankind — by Isaac Asimov

If I am remembered in it, it may well be for having established the base for the society of that time. Because I do feel that when robots or intelligent computers actually come into existence something very much like the three laws will have to exist.

Perhaps when the three laws of robotics are established they will be known as "Asimov's Three Laws" — well it's nice to think of.

Evans: Do you feel that current developments in artificial intelligence, leading possibly to a computer which could have some bits of self-consciousness, are likely to affect man's image of himself? How will human beings react to such extraordinary developments?

Asimov: Well, I suppose man will resent them and there will be a strong effort, which may win out, not to produce computers that are rivals to man, or to destroy any that are produced.

Now I have definite views which perhaps put me in a rather tiny minority in this respect. Let's put it this way: so far evolution has come along through hit-and-miss, random processes, and perhaps once you achieve a species which is intelligent enough to guide evolution rather than be a slave to it, then the old random hit-and-miss methods are no longer efficient.

In other words, from this point on we should expect mankind to start guiding evolution, both of his own and of other species.

Well, an "artificial intelligence" is of course another species, and perhaps if we can more rapidly produce an artificial human brain, then that is the direction that evolution ought to go, regardless of our personal feelings.

It doesn't matter to us that the reptiles probably disapproved of being replaced by the mammals, or that the mammals themselves probably disapproved of having the primates take over the leadership, or that the lower primates would resent the superiority of Man. All life forms, perhaps, if they had the vote, would disapprove of mankind dominating.

Now we don't care about such disapproval. We feel that evolution ought to progress in the direction that it does, as long as we are the end-product.

Well, by the same argument, there's nothing sacred about us either and there's no reason why an intelligent computer, an artificial intelligence superior to our own, should not succeed to the "domination of the world" in the same way that we have already done. Nor would one expect him to be bothered about this or what we feel about it.

In fact, considering what we — Man — are doing to the world right now, my own feeling is that it's a shame that we can't get the intelligent robots to take over faster than they are likely to, so that they can save the earth.

Evans: That sounds like a good theme for a capillary novel.

Asimov: So it does, and it puts me in mind of a story written back in 1956 called "The Last Question". It is my favorite because, of all my stories, this was the one in which I allowed my imagination to run mad.

and to dip into the future as far as the human mind could reach.

It's really a description, in six scenes, of the next trillion years in human history, showing the parallel development of human beings and computers.

It shows how at each stage humanity makes enormous strides, from developing use of direct solar energy, to developing inter-stellar travel, to developing immortality, to developing the ability to live outside bodies, and so on.

At the same time computers become more and more ad-

vanced, more and more capable, more and more existent in hyperspace, more and more able to be everywhere in the universe.

Finally they get so intelligent and capable that all you've got to do is to ask them a question and the super-computer answers.

Now all through this history there has been this continual question arising — hence "The last question" as the title — as to whether there is any way of reversing the inevitable death of the universe; but no being,

human or computer, has ever been able to answer it.

And then at last the universe does die. All that exists is the super-computer in hyperspace and the last human souls who have somehow been made one with it. And then the computer hovers over the dead universe to decide what it can do about it, until finally it works out how to restore everything.

And the computer says, "Let there be light." And there was light.

\* I ROBOT, by Isaac Asimov, 60p. Published by Panther Paperbacks.



Isaac Asimov... "How does one know for sure that a man is not a robot, or even a robot is not a man?"

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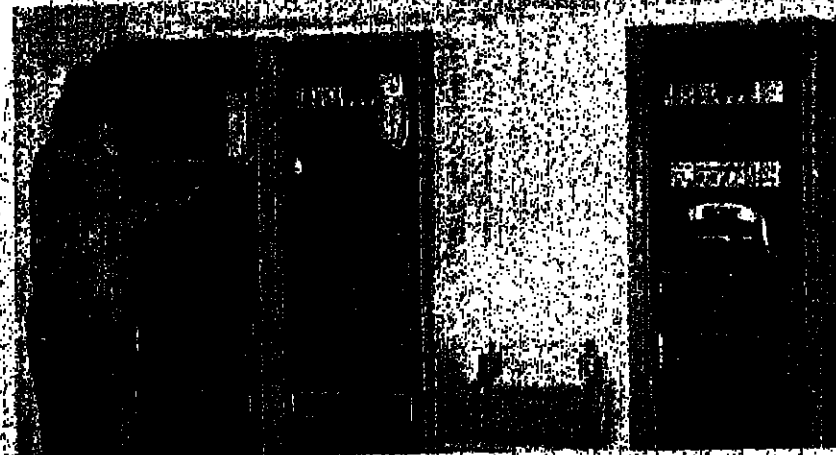
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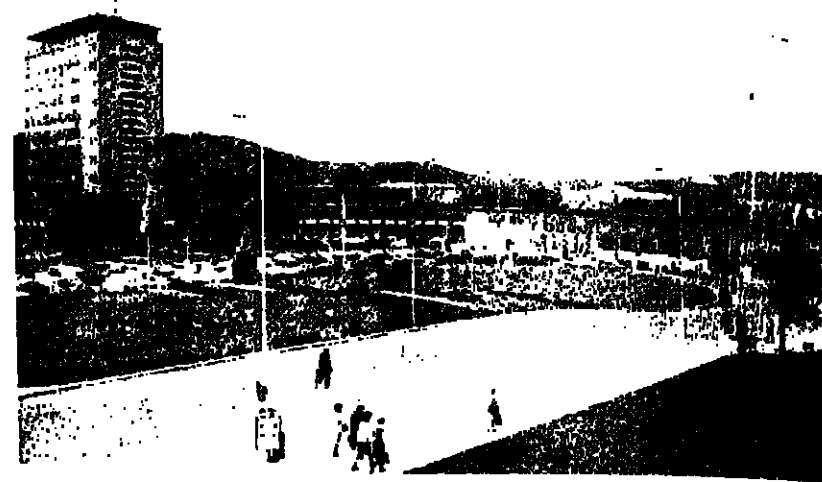
As long as there is East-West political détente, there will also be a growing demand for East-West trade.

At the 19th International Engineering Exhibition in Brno, Czechoslovakia, last month more than 25 countries were represented, including exhibits from America, Japan and most Western European countries. MALCOLM PELTU reports that, at first sight, Pavilion D at Brno, which was devoted to computers, bore a striking resemblance to any Western computer show, with familiar names like IBM, ICL, NCR,

Univac, Olivetti, Redifon and Scandata well to the fore.

But beneath the surface, he found Brno worlds apart from Western exhibitions like the National Computing Conference in Dallas, which he attended earlier this year.

In this article, Pelu discusses the differences and explains the best ways in which Western companies can run successful trading operations with the Socialist countries of East Europe.



The scene of the Brno exhibition.

## How to do business with the Socialist countries

IT is a long way from Dallas to Brno; from the brash razzamatazz of the National Computing Conference to the no-frills directness of the Czechoslovak international engineering exhibition.

At the NCC earlier this year (CW, June 6), there was glitter and waste, aggressive marketing and selling, and a sparkling array of new products.

In Brno last month, a Texas Instrument calculator or a TV game on the Redifon stand were sufficient innovation to start a queue forming. There was little selling capitalist-style, no significant new computer products — but a great deal of serious business talk.

For one of the first things any Western company trading with the Socialist world should realise is that the whole ethos of business life is different and demands special understanding.

It would be no use for a company to try to start a selling operation in Czechoslovakia by hiring a stand at Brno, displaying some products accompanied by a couple of salesmen and then

hoping to pick up a few orders.

That is not the way to do business with the Socialist countries.

It takes time and experience to get to know how to sell goods in countries where centralised planning with central buying and selling organisations play a central role in the economic life.

Czechoslovakia, for example, is currently in the second year of its sixth five-year plan. The

five-year plans are the economic milestones in the economy of the country and set the pattern for investment in equipment. Purchasing decisions often depend on the stage that has been reached by the plan rather than on a particular customer need.

Purchasing decisions often depend on the stage that has been reached by the plan rather than on a particular customer need.

Organisations in Socialist countries wishing to purchase equipment from the West must also be able to make a convincing case why it should receive the required foreign currency allowance.

The value of knowing the market is illustrated by Roger Landau, who heads Redifon's Czechoslovak operations (CW, June 9).

Redifon is one of two British computer companies — the other is ICL — which have been accredited in Czechoslovakia.

This means that the company can have its own representatives and offices in the country. Otherwise, companies must operate through Czechoslovak-run foreign trade representatives.

Landau had been working in Czechoslovakia for nine years with ICL before joining Redifon in 1974. He says that by the end of this year he hopes to have sold 60 Seecheck key-to-disc systems — almost twice as much as the nearest Western rivals Pertec, whose data capture systems are marketed to Czechoslovakia via Robinco, a Swiss company.

Data capture is an important requirement in an economy with a centralised structure that has the need to process large volumes of data.

The experience of another data capture company, Scandata, illustrates another important characteristic of the market in Socialist countries: once you have a foothold in the market, customer loyalty can be high, provided the service offered shows a serious long-term commitment.

Scandata Optical Character Reading equipment had been sold to Czechoslovakia by Interscan Ltd, until last year when the company ceased trading.

But Peter Wolling, who now runs the Czech operation from Scandata's West German base, says that Interscan's financial problems did not seriously affect his Czechoslovak business because all the promises made by Interscan had been fulfilled by Scandata.

Petr Muller, of Kovo, the Czechoslovak foreign trade corporation, emphasised the importance of long-term relationships when I asked him about the potential of the Czech market for Western computer companies.

Contacts built up over the years with what he called the "traditional suppliers," such as Redifon, ICL and IBM, are greatly respected so that a new company would have to make an exceedingly good case before being able to enter the market.

But he did pinpoint one new area of technology to which there is "an open door" — the microprocessor.

Calculators are a much sought after commodity in Czechoslovakia and calculator displays by Texas Instruments and Hewlett Packard attracted a great deal of attention.

In the mainframe business, there is one thing in common between East and West — the dominance of IBM.

Although other Western countries have significant installation bases in East Europe, there is strong pressure for standardisation through the USEC range of IBM-like systems that are being built as a joint effort between a number of Socialist countries.

USEC, the Unified System of Electronic Computers, is better known by its Russian name

Riad. It consists of a range of six processors plus a variety of compatible peripherals, each Socialist country concentrating on a particular processor and line of peripherals.

Czechoslovakia, for example, has built one of the smaller processors, the EC 1021, and develops and manufactures equipment such as punched card and paper tape readers and punches, and a plotter, the EC7054 Digigraph, which is claimed to hold its own with Western competitors.

The prefix EC before any item of equipment indicates that it is USEC compatible.

As the USEC processors and operating systems are virtually the same as IBM systems, there could be increasing pressure from users in the Socialist countries for IBM-compatible systems.

Rolf Dollna, marketing director of the Vienna-based company Equipex, which sells Hewlett-Packard and Bullman computers in Poland, Rumania and Bulgaria, told Computer Weekly that he is looking for new peripheral products to market in these countries as he believes there is still great potential in these areas, although he is doubtful about the future of mainframe sales once the USEC range really gets off the ground.

This move towards IBM-compatibility has not affected ICL, which has just captured its first East European order for a 290 system (see front page).

With a user base of over 30 systems and a successful trading record going back to the mid-sixties, ICL has sufficient strength in Czechoslovakia to counteract the move to USEC and IBM compatibility.

In any case, although there are a large number of USEC systems already in operation, there still seems to be a sufficient technological gap between East and West for systems like the 2900 series to outperform the EC systems.

Although the Western businessman operating in East Europe will have to adapt to a different economic lifestyle, there is still much in common with the West.

Ubiquitous languages like Cobol, Fortran, PL/I, RPG, etc. are to be found on the USEC range.

And trendy technological concepts like distributed processing were very much to the fore.

One of the most impressive East European exhibits at Brno was from the East German Burroughs Export, which had on show Robotron micro-frame systems and Dapo small business machines.

I asked Frank Zilger of Robotron, about computer trends in the Socialist countries. "Over the last two years," he replied, "there has been a growing demand for distributed processing."

And what will you have produced by the end of the year? "Smaller, quicker, cheaper, more flexible," he replied.

And for a moment, I thought I was back in Dallas.

This biennial show that brings users flocking to Munich from all over Europe, opens its doors again next Monday as Systems 77.

As in previous years, the event combines a big exhibition of minicomputers, peripherals and small systems with a comprehensive program of symposia and seminars. All the papers presented will be translated simultaneously from German into English.

The Systems 77 symposia will include a session on distributed processing on October 17, while the three areas covered separately on October 18 will be software development and those two highly topical subjects, the electronic office and the microprocessor revolution.

The seminar program, which covers all five days of Systems 77, includes sessions on the application of computers in banking, insurance, medicine, public administration and manufacturing.

Most visitors to the show are expected to be German and the line-up of exhibitors, not surprisingly, will include an impressive array of domestic suppliers. But as in 1975 a sizeable contingent of UK based companies — 18 of them this time — will be showing the flag on a joint stand sponsored by the Business Equipment Trade Association and the Department of Trade.

The US based multinational suppliers will also be amply represented. The computer industry giant, IBM, no less, will be there, along with some of the better known independent minicomputer and peripheral manufacturers.

Two of the most important products on the IBM stand, both aimed at taking a chunk of the burgeoning minicomputer sys-

### New Era launch

ONE of the world's biggest independent peripheral manufacturers, Dataprodukte, is using Systems 77 to launch what it calls its New Era range of products. These include the 45-200, a 200 lpm matrix printer, the 5-300, a low cost 300 lpm band printer, and the T-80, an 80 cpi thermal printer.

Dataprodukte will also show a range of its existing line printers and core memory units.

Items market, will be the Series 1 mini and the Systems 34 multi-terminal transaction processing business system. Also on show will be the older, less versatile System 32 and the 5100 — the desk top computer that comes with APL.

Taking advantage of the medical interest at the show, Digital Equipment has decided to put on a demonstration of the KICSYS system developed by the Kirchlichen Gemeinschaftsverband. This translates roughly as the Church Council for Data Processing. The system handles administration of patients and the pathological laboratory.

No big German computer show would be complete without Nixdorf and like DEC the leading German small systems manufacturers will demonstrate some practical applications. These will include a motor deal system, the Nixdorf Infos production control package running on an 8870/4 and a hospital registration on the Nixdorf 620/45, a development of the 600 key-to-disc system.

Transdata, one of the UK contingent, will be using Systems 77 to introduce two microprocessor-based systems to the Continental marketplace. These are the CX400, described by Transdata as a general pur-

Jones previews Systems 77 which opens next Monday

# Small systems dominate Munich show

pose system, and the Model 309, an intelligent flexible disc storage system designed for on-line file management and text editing. The CX400 comes with two Intel 8080 micros, one for housekeeping and the other for customer programming with a user memory expandable in 8K bytes up to 32K bytes.

Microprocessor-based data storage will also be featured on the stand of another UK firm, Sintrom Electronics, in the form of its Perifile 6041 cartridge tape file. This is offered as a replacement for paper tape storage and uses a micro for automatic file searching and error handling. It can operate as a high speed remote I/O device and meets the requirements of the ECMA 46 and ANSI standards.

Other Sintrom products on show will include the IBM 3740 compatible Periflex 6550 dual floppy disc system.

Gresham Data Systems, part of Gresham Lion Ltd, will be demonstrating a varied range of equipment manufactured by its associate company, Process Peripherals. These will include rugged hand per track disc stores, image display systems and computer graphics equipment.

The Series 100 and 110 rugged disc stores have maximum capacities of 5.12 and 17.6 Megabits, respectively, an average access time in each case of 10 milliseconds, and a data transfer rate of four Megabits per second. They can be supplied with standard interfaces for most popular minicomputers, including the PDP-11, and their manufacturer quotes a mean time between failure of 15,000 hours. The quoted operational life is 100,000 hours.

The Series 121 LMD image display system from Gresham can enhance and display information from sources like weather satellites, medical scanners, process control transducers and electron microscopes. The display system on show, the Series 114, can generate complex colour and monochrome pictures from coded instructions.

Northern Software, one of the select group of UK software houses appearing at the show, is hoping to repeat the success of its Systems 75 appearance, which led to business being picked up in Germany, Switzerland and the Netherlands for its range of standard accounting packages.

Northern Software points out that its programs are available in German, Dutch or French, as well as English, and cover sales, purchase and nominal ledger processing.

But the main feature on the Northern Software stand will be the new NOR-INV invoicing package currently being field-tested with selected users in the UK. This enables almost any type of business to produce invoices on its computer by allowing the user to specify the layout and content of the invoice, and the pricing and discount structure of his business.

Management Systems and Programming, one of the UK's most successful software houses

in overseas markets will be presenting online demonstrations of some of its leading products. These include Datamanager, a data dictionary system aimed particularly at organisations planning to move to a full-scale database management system.

Also on show will be MSP's Testmanager, a testing system for improving programmer productivity on a wide range of computer systems.

A new schematic drawing system, called LEADS, will be demonstrated by the UK's Computer Aided Design Centre at Systems 77. The system can capture, edit and reproduce 2-dimensional schematic drawings and is written in interlinked software modules. Extra modules can be added to these for interpreting the information in the database built up by the basic modules.

CADC believes that this ap-

proach bridges the gap between standard hardware/software packages and expensive turnkey drafting systems. Input to the system is normally via a Tektronix storage tube, while output can be either on a storage tube or plotter.

Though it is the biggest European based computer manufacturer, ICL will be putting on a fairly modest show at Systems 77, having decided to take a booth on the Joint UK

exhibit along with the smaller British firms. The two products being featured by ICL are the System 220 small business computer that it introduced early this year as a re-launch of the Singer System Ten and the 7502/15 terminal system. This will run an order entry application while the 220 will be shown running some general commercial jobs.

The leading UK peripheral manufacturer, Data Recording Instrument Co, will be showing the latest additions to its range of matrix printers, cartridge tape drives, diskette and disc drives. The latter includes the 3300 fixed disc drive which has a capacity of more than 75 million bytes and comes in the form of a seven inch unit that fits into a 19-inch rack.

DRI will also show a development of its Series 4000 fixed/exchangeable disc drive range which holds 12 Megabytes on a single spindle — six on a top loading cartridge and six on a fixed disc.



### The European source of computer peripherals

DRI is Europe's largest manufacturer of computer peripherals. Its products are available from DRI offices in London, Manchester, Birmingham, Bristol, Glasgow, and from DRI offices in France, Germany, and the Netherlands. DRI has a large inventory of stock, and can deliver most products within 24 hours. DRI also offers a range of services, including installation, maintenance, and repair. DRI is a member of the European Computer Manufacturers Association (ECMA).



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## COGARVIEW UPS—a way to stay in business when others have shut

long enough to cause any real problems.

Now that everyone knows just how vulnerable power supply is even in the world's largest and most sophisticated city, it is doubtful if any line manager could look his computer staff in the eye again and say that a UPS was unjustified.

If the blackout makes a fortune for anyone it will surely make a fortune for manufacturers of uninterrupted power supply systems.

I have always been an advocate of UPS, and at the Cogar Corporation we raised a few eyebrows by building a UPS capability into some Singer 1500 units as standard.

I thought then, and I am prepared to say I'm sure now, that we were just a little ahead of our time. In a few years, only cut-rate independents will dare to offer any major device with-

out some kind of inherent guard against loss of power.

There are really two kinds of UPS, or rather a smaller and larger version of the basic concept. The stripped-down UPS provides battery back-up for mains power and thus something around 10 to 20 minutes computing for the entire system, or be up to an hour for just essential elements of the system (there may be considerable variations here according to size), and it automatically ensures constant power supply free of fluctuations at other times.

The "tuxedo-ed" UPS does all this and one more thing: it switches on a standby generator to replace its own battery power once the 10 or 20 minute mark begins to loom if mains power still has not returned.

Of course most devices are designed with certain tolerances to voltage fluctuations.

Neither processors nor peripherals are going to crack up if there's a surge or a drop of power within a few fractions of the stipulated input.

In the UK many computers have operated without trouble even when strikes have resulted in long-term voltage reductions of up to 10%. I am told (though some VDUs began to suffer at the 6% mark).

But in the US there is a constant threat of brown-outs, and at least for the next few years the threat is likely to increase rather than diminish.

Indeed, if the environmental people get their way, volatility of power supplies could become a permanent feature of many parts of the US, just like it is in most developing countries.

In the face of this threat, it seems madness to take no more precautions than insuring your system will dump out all vulner-

able data before it switches itself off.

Unfortunately the UPS concept seems to have been misunderstood by users. It is not a way of postponing shutdown by a few minutes — though even that can assure an orderly closure of files.

Properly designed, a UPS system is a way of staying in business when everyone else has shut-down — either for the full stretch of 90% or more of all power losses; or, at a little extra cost, for even two-day blackouts like that which nobody ever thought could happen until it happened in New York.

The concept has been misunderstood because the idea has got around that a worthwhile UPS is appallingly expensive. This is because the best-known UPS users to date have been airlines with huge reservations systems to protect, or time sharing services with enormous networks.

For companies like these, a UPS can cost as much as \$2,000 per kVA. CallData's 380 kVA UPS cost \$250,000 (£144,000) five inflation-ridden years ago.

But figures like this are misleading. In the first place they have to be contrasted with the possible loss of income resulting from power losses during the period of their amortisation. In the second place, the capital cost can be fairly insignificant for small users.

I would be willing to bet that there are many smug DP managers in New York today who know that their "expensive" UPS paid for itself in one burst this summer.

There are two reasons why I am so confident that the UPS concept is going to become widespread. The first is the rapid growth of data communications, which is about to enter an altogether new, enhanced phase with the launch of CES.

Has anyone noticed that the telephones go on working when there is a power strike? Telephone companies all realised years ago that power loss could have catastrophic results, and their systems are all fully backed up by UPS.

There may be a curtailment in the number of lines available into and out of the affected area, but the network itself keeps functioning.

Exactly the same has to apply to data communications networks. Imagine, for instance, a network with a concentrator installed at one location serving, say, 40 users at different places.

No network can risk loss of

power at the concentrator suddenly. The more users at stake, the less significant the capital cost of the UPS becomes.

And the other reason is that battery technology is improving all the time. It has been a painfully slow process, but it has begun.

Sealed lead-based batteries are a lot more reliable and take many more recharging cycles than old fashioned batteries. I am certain that further developments will make batteries last longer, recharge quicker, take up less space and cost significantly less so that in a few years' time no computing device will be complete without its integral UPS.

In the meantime the computer industry is going to become a happy hunting ground for UPS salesmen. Most will be of undoubted integrity, a few will not.

So some words of advice from a UPS protagonist to the unwary potential user: First of all, consult a good electrical engineer before making a move. Secondly, assign a cash value to downtime — easier for some than for others. When you are working out this value, try to include a notional figure for frustration, customer aggravation, late completion, maybe even loss of data or of business.

Thirdly, calculate on the basis of your cash value (amortised over as many years as you reckon your UPS should last before replacement) whether you need a UPS with full systems capability, or whether you could devise an automatic shutdown of inessential parts of the system with consequently reduced needs for batteries. Then work out what sort of risk of major power loss you are prepared to take.

Are you going to gamble that few shutdowns last more than an hour? Or are you going to assume the worst, limit your UPS to five or ten minutes and have a standby generator installed instead of extra batteries? Now you are ready to start looking for hardware.

And when you do, you are in for a shock. All the salesmen will dwell heavily on the MTBF of their systems. Unfortunately, even UPS systems break down, and you should ensure that your consulting engineer has worked out the need for the cost of preventive maintenance before you sign the contract. Maintenance costs rise exponentially alongside increasing battery sizes. Operating costs of a big UPS can run as high as \$20,000 (£11,450) a year.

## Computers that talk and listen

● From Page 16

tables that have greater fidelity than those developed by simply applying phonetic rules to the spoken words. The results of the expensive process include phonetic data, pitch information and a description of phrasing that is analogous to a musical score.

In commercial applications the development of an easily-understood vocabulary for a synthesiser will be an important part of any software project. For hobbyists, whose needs may be met by less refined electronic voices, the economical synthesis-by-rule approach will be the most common method.

With practice, a programmer can modify the data drawn from phonetic rules to improve intelligibility greatly. This tuning requires a good ear and a great deal of patience, but it is a way for the amateur to achieve impressive voice quality using a simple computer system without incurring high costs.

Among the opportunities opened up by the development of these low-cost applications for computers are many applications for the handicapped.

Other fields that will immediately benefit are industries in which a spoken voice may command machinery, medical systems, particularly those for surgeons whose hands are occupied, and data entry operations, where a computerised voice may be used in conjunction with a telephone for processing.

## ROUNDUP

THE latest contender for a share of the potentially enormous market for electronic office equipment is the worldwide oil corporation, Exxon, which is now to introduce a low-cost text editor to compete directly with IBM's memory typewriters.

Exxon, better known in Europe as Esso, is also weighing in against Xerox and AT&T, the US telecommunications giant, for a share of this market. The text editor, called QYX, is being built by Quix of Limerick, Pennsylvania, a firm set up by Exxon Enterprises, a venture capital organisation established by Exxon as part of its long-term diversification plans. (CW, September 29.)

THE top three executives for Insa, the National Enterprise Board's computer services company have been appointed. John Preece, who was NEB deputy director of computers and electronics, has become its full-time managing director. Tony Chander becomes Insa's director of business development responsible for all new business ventures outside the UK, and Seymour Joffe becomes the head of Insa's US operations as president of Insa Inc. (CW, September 16.)

GOVERNMENT officials responsible for university computing in Austria, Belgium, Denmark, West Germany, Holland and the UK met at Bath University at the first Conference of European Computer Boards. The conference discussed a number of common interest and looked at the possibilities of international university collaboration. (CW, September 16.)

THE French Socialist Party has announced that it intends to nationalise the country's only mainframe manufacturer, CII-Honeywell Bull. If the "Left Alliance" wins the next General Election next March, its main partner in the Alliance, the Communist Party, has only proposed nationalisation of Compagnie des Machines Bull, which holds 53% of the CII-HB equity. (CW, September 22.)

THE biggest boost to date for the interactive language Mumps was received last week, with the announcement that specifications for an ANSI standard for the language have been accepted by ANSI's DP committee. X3. The Mumps ANSI standard was first completed almost a year ago (CW, September 23, 1976). Final approval gives this relatively new, user-developed language a status so far achieved only by the "industry standard" languages such as Cobol, Fortran and Basic. (CW, September 22.)

CONTRACTS for the development of prototype compilers for the US Department of Defence's planned standard real time language have been awarded, with a disappointment for the UK. Three of the four contracts have been awarded to US-based developers, with a nod in the direction of Europe, which effectively excludes Algol 68. UK's last candidate for a base language, Unexpedient, all implementation are based on Pascal, a highly structured language developed by Niklaus Wirth of Zurich, on the basis of work in collaboration with the UK's Professor Tony Hoare. (CW, September 28.)

IN what is seen, in part, as a defensive move against possible nationalisation of CII-Honeywell Bull, in France, Honeywell is planning to extend

## Exxon joins the battle of the giants with QYX

the power of the Level 6 minicomputer line to match most of the French-built Level 64 series. (CW, September 29.)

AS a follow-up to its Fortran-oriented "supercomputer", the Scientific Processor (CW, April 14), Burroughs has developed a modified version with a reduced, but still impressive, Fortran performance, aimed at a wider market. Known as the Attached Fortran Processor, AFP, it is like the Burroughs Scientific Processor, designed to work as a "back end" to a general-purpose Burroughs machine and can be attached to the B6700, B6800, 7700 or 7800. (CW, September 28.)

WITH the aim of gaining a foothold at its competitors' big customer sites in Europe, Honeywell has launched the Page Printing System, PPS, which runs at up to 18,000 lpm and operates offline, accepting magnetic tapes from any type of mainframe. The PPS has been test marketed in the US for two years and was officially launched earlier this year at the National Computer Conference in Dallas. (CW, June 23.) (CW, September 29.)

### Zooming up TV sports

"The most significant TV development for sports coverage since slow motion replay machines were introduced," was how American Broadcasting Corp production staff described a technique produced by British know-how. Using the DPE 5000 developed by Quantel, of Catorham, Surrey, ABC established a world "first" in television broadcasting on September 15. Used during the broadcast of the finale of the World Series Baseball, viewers were shown a computer controlled zoomed-up version of certain incidents. This version captures the incident in detail, no matter how insignificant or small it appears in the original shot. (CW, September 29.)

A FURTHER addition to the Philips line of workstation-oriented business computers has been announced in Germany. Called the P430, it will slot between the P420, announced last year, and the P440, launched at Hannover in April, 1977. (CW, September 28.)

FORMAL agreement has been reached between ICL and the South-West Universities Regional Computing Centre, on the development of an Algol 68 compiler for the ICL 2900 series. The compiler is scheduled for release in October next year, and will be part of ICL's standard product range. (CW, September 28.)

ONE of the most successful independent teleprocessing monitors for ICL machines, Telecomputing's TFS, has been taken up by ICL for marketing in the UK and Europe. The package is being marketed on a par with those outside Europe, to whom ICL has been supplying TFS for almost a year (CW, November 24, 1977). This agreement with Telecomputing gives ICL non-exclusive world rights to supply TFS for use on ICL's 2900 and 2901 machines and on the ICL 2900 series running under DMS. (CW, September 28.)

A summary of main news items which have appeared since the last issue of Computer Weekly International on September 8.

only to receivers also capable of taking ordinary television signals or to commercially-available Viewdata-only terminals planned by companies like GEC and IIT. (CW, October 6.)

AN international reciprocal agreement concluded last week should ensure wider marketing opportunities and better support in Europe for two popular teleprocessing monitors, Westinghouse's Estl, for IBM machines, and Zeus-Hermes' Cortez, on ICL equipment. Westinghouse has taken marketing rights for Cortez in Europe and Zeus-Hermes has undertaken to provide implementation support for prospective West users in the UK. (CW, October 6.)

A COMPLETE range of peripherals for IBM Series 1 minicomputers is to be introduced by Control Data within the next two months. The range will include matrix and line printers, a video terminal, disc drives and add-on memories. (CW, October 6.)

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## Irish air traffic control link

THE Irish end of Eurocontrol, the international body which handles air traffic control over much of Europe above 25,000 feet, has called in Cara Data Processing of Dublin to install Racal-Milgo modems and switching equipment to link a radar station at Mount Gabriel in the extreme west of Ireland with the Eurocontrol centre at Shannon, and the Civil Aviation Authority's centre at West Drayton, Middlesex.

The installation in Shannon consists of two CII Iris 45 mainframes.

## Saudi Arabian contract

SAUDI Arabia is now the biggest market after the UK for business forms specialist PFC (Business Forms) of Cradley Heath, near Birmingham. The latest contract is from the Saudi Arabian government which has ordered optical mark recognition forms for two university research departments. The forms will be printed in Arabic and English and the company says the fact that it has Arabic speakers on its UK staff is one reason for its success in Saudi Arabia over the last 18 months.

## NBI to expand

EXPANSION of word processing marketing into Western Europe and the Far East has been announced by NBI, of Boulder, Colorado.

NBI currently markets its software-based range of word processing equipment solely in the US.

# COMPUTER WEEKLY INTERNATIONAL

## Adding a sporting touch to negotiations

FOUNDED by a former computer salesman, Joseph Auer, International Computer Negotiations provides users with negotiating — not legal — advice, runs seminars for the people who are involved in the purchase of computers and publishes a remarkable newsletter, CNReport.

The firm is also noteworthy for its resistance to the pressures of big-city business and makes its home in Winter Park, Florida, a town of 22,000 near the middle of that peninsula state (47 miles) due west of the Kennedy Space Centre and a stone's throw from the Disney World amusement park.

Auer believes that computer contract negotiations should be more sporting, and in fact he is a sportsman himself. Before founding ICN in May, 1975, he was a professional footballer for five years, with the Buffalo (New York) Bills, Miami (Florida) Dolphins and Atlanta (Georgia) Falcons.

It was in Atlanta that Auer first worked in the computer business as an employee of Management Science America, MSA, the software company. Honeywell was his second — and last — employer on the selling side of the business.

Hesh Wiener reports from New York

Joe Auer's abilities in both sports and computers compelled him to try his hand at the underdog's side of the business. And that is how International Computer Negotiations came into being.

ICN's advantage is an insider's knowledge of the areas in which vendors can give in on price and service. As business has grown, ICN added to its Honeywell expertise by hiring former employees of IBM, Burroughs, Univac and even the US Justice Department, which lost a member of its IBM anti-trust staff to ICN's all-star negotiating team.

The firm's experts don't come cheap, but they believe their advice is one of the few bargains in the computer business. For a fee that runs about \$1,000 per day, ICN will supply an appropriate bargaining adviser.

The firm claims that its clients save about \$100,000 on a typical purchase or lease worth \$1,000,000, and they do it without having an ICN expert coach them for 100 days.

As ICN's business grew, another need became

apparent to Auer, the need for basic knowledge. Last spring ICN launched CNReport, its monthly newsletter. It has garnered hundreds of subscribers, and not all of them are computer buyers. Among the readers of CNReport are nearly all the US mainframe vendors, plus the big names in minicomputers and leasing.

Helping with the publication are well-known contract advisers, including Dick Brandon.

ICN's other venture is a series of seminars that will make the firm truly international. Based on a successful US programme, ICN's European lecture tour will begin in London next April, Brussels and Stockholm will follow.

Where does all this leave Joe Auer, former football player and reformed computer salesman? Will he quit when he has made his first hundred million and buy a professional football franchise? "No way," he says, now the complex businessman "I'll buy myself a leasing company."

CNReport, ICN, Box 384, Winter Park, Florida, 32790, USA. \$185 per year plus \$25 for airmail to Europe (above £125 from UK).

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## Siemens version of Easytrieve package

ANOTHER software company which made its name in the IBM market has acknowledged with a product development the force of Siemens in the West German user community. Pansophic Systems, of Illinois, has produced a Siemens version of its Easytrieve information retrieval package.

Until now Pansophic's products have been entirely oriented to the IBM 360 and 370 series, apart from early versions for the RCA Spectra 70.

The new Easytrieve will run on Siemens' 4000 series under the BS1000 and BS2000 operating systems.

The 4000 architecture has close affinities with that of the Spectra 70 and also with the ICL System 4 — a point which could prove of interest to the UK market. The Siemens operating systems bore some similarities to IBM software, easing the conversion task.

Pansophic acknowledged that the large number of Siemens users in Germany was the main motive for developing the new version. Other previously IBM-dedicated software companies have perceived this need, notably the UK's Altergo.

Pansophic could not comment on any plans to transfer their other products — the Panvalet library system and the Panda disc space analyser — to Siemens equipment; nor could the company say if any other hardware was being investigated with a view to conversions.

Siemens Easytrieve has already been installed at test installations in Germany and Scandinavia, said Pansophic.

## Telex double

ITALY has been added to the list of countries where Telex sells the Lockheed System III as a replacement for IBM's System 3 and a competitor for System 32 and 34.

Telex has so far installed 36 System IIIs in Europe, 14 of them in France, and is looking for sales of 100 Europe-wide by next March. In most countries, Telex sells to existing IBM users, but in Ireland the system is being sold in competition with System 34 and has already scored two victories.

An enhanced operating system and a database system are under development at Lockheed, which will enable the System III to support up to eight Calcomp T200 200 Megabyte disc drives. A multiplexer to support 32 terminals is also on the way.

# Polish packet-switched network gets under way

By Tim Palmer

POLAND'S experimental packet-switched network has progressed to the point where there are two mainframes attached to each of the three nodes along with several minicomputers and terminals.

The project is being managed by the Institute of Communications in Warsaw and is similar in scope and conception to the French experimental Cyclades network which was the proving ground for much European packet-switching technology.

Having started on the project long before international standards like the X25 interface were established, the Poles have run into similar incompatibility problems to those encountered by the UK Post Office with EPS.

A particular problem is posed by the unlikely choice of switching computer, made as long ago as 1972 (CW, August 8, 1974).

The machine selected was the

Singer (now ICL) System Ten and, because the machine has a six-bit character, it is incompatible with the 8-bit frame of X25. The link from node to subscriber uses the IBM bisynchronous standard. But because only half-duplex modems were available, the Institute has had to develop its own protocol.

The network has three nodes, in Gdansk, Warsaw and Katowice. In Gdansk, two Odra 1300 series mainframes, which run ICL software, are connected. One belongs to the PTT and the other handles applications relating to administration of shipping.

In Warsaw there is an ICL 1900 series machine at the statistics institute and an IBM 380 in the Ministry of Engineer-

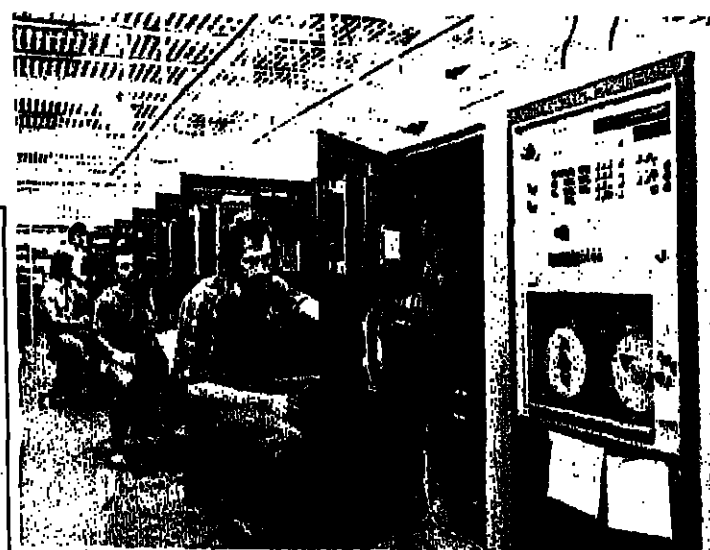
ing attached to the network, while in Katowice there is an Odra used by mining industry and a 380 belonging to the chemical institute.

Links between nodes are 4800 baud, and the mainframes are linked to the switches at 2400 baud. In addition a variety of terminals, including DEC PDP-11 minis and ICL 1500 intelligent terminals are linked asynchronously.

Because only half-duplex modems are used, acknowledgment of packets received are sent in the next block of data transmitted. Services being implemented include virtual call, where a subscriber uses the network as if he had a continuous direct link to the receiving machine for the duration of

the call, and datagram, where short messages are sent and received at random, sequencing being done at the remote site.

For the future, the Institute is considering changing the System Tens for Polish-built Mera 400 minicomputers.



Numerical control is becoming big business for Siemens, which has now sold almost 8,000 systems since it started in this area. The company is aiming at another 1,000 sales worldwide this year, which will mean a revenue of about DM80 million. Extensive use is now made of microcomputer technology in equipment such as the Sinumark System 7, seen here being manufactured at the company's Erlangen plant. More than 180 of these and other NC systems from Siemens were on show at the European Machine Tool Exhibition in Hannover last month.

## Philips approaches to IBM and Univac

FACED with the long-term need for a successor to the Philips P1000 machines in Philips' own factories in Eindhoven, Holland, the company has made preliminary approaches to Univac and IBM.

With the collapse of the Unidata venture (CW, September 11, 1975), Philips pulled out of the mainframe business and concentrated on small machines. The company's own P1000s are likely to remain in

use until 1980, said a spokesman. The chief criterion for a replacement for after that date will be the availability of compatible software on the machine selected, he added.

The selection of a machine will not immediately bring a recommendation for appropriate conversion by the P1000 users outside Philips. Such a recommendation could, however, emerge in two to three years' time, said the spokesman.

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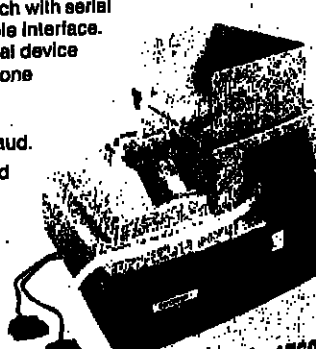
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Basic salaries are negotiable. Excellent commission, bonus and fringe benefits.  
Contact: Jim Baker.

**Analyst/Programmers**

Surrey c. £5000  
This is an opportunity to broaden the scope of your responsibilities working for a successful software house engaged on varied and challenging projects. Applicants should have at least twelve months' experience of FORTRAN or ASSEMBLER programming gained in the development of small real-time applications. Work involves customer liaison on projects that are either commercial or technical.  
Salaries are negotiable according to experience.  
Contact: Margaret Stevens.

**Programmers & Analysts**

Central London £ Neg.  
A leading oil company have announced vacancies in their expanding d.p. group. The positions involve considerable user liaison and problem investigation. Candidates must have either a COBOL, RPG, ASSEMBLER, or FORTRAN background ideally on IBM equipment.  
First class employment package and benefits.  
Contact: Mike Creamer.

For further information on any of the above vacancies please contact the appropriate consultant. If your qualifications do not match the above positions but you are seeking other opportunities please contact us anyway.

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International Personnel Consultants

16 Maddox Street, London W.1. Tel: 01-491 4478

**AUSTRALIA**

If you are a programmer, systems analyst, or higher level, with at least three years post-training experience and thinking of emigrating then we can help and advise you. This extends from initial career prospects assessment to acquisition of a suitable and worthwhile position in Australia. In addition we arrange for you to receive a comprehensive information package which will assist in making accurate cost and living standard comparisons in advance; we can also advise on migration procedures and time scales.  
Great opportunities, salaries, and prospects.  
Contact: Mike Creamer.

**Technical Authors & Engineers**

Attractive opportunities in many parts of the country  
Contact: Mike Creamer

**Personnel Manager**

London c. £7500  
A well established software house, based in London, wishes to appoint a senior manager to take responsibility for the personnel function.  
This is a new position and the company expect the right person to be on the Board in two years.  
Applicants must have considerable experience in the personnel field particularly in recruitment, training, resource planning and career development. Preference will be given to candidates with a computer background.  
Excellent opportunity with first class salary and benefits.  
Contact: Jim Baker.

**SENIOR PROGRAMMER**

Beckman Instruments Limited require a Senior Programmer with several years' experience of IBM Cobol. Experience with ICL Cobol would be an added advantage.

Equipment includes ICL 2903 with EDS 60s, RJE link to dual 370/158s under OS/VS in California and local ICL 7502 communications.

Planned applications include development of an on-line order entry system and database software using TOTAL. The successful applicant will be expected to play a major part in this development.

Salary is negotiable and fringe benefits include a non-contributory pension scheme, together with life assurance and sick pay schemes. Attractive housing is available to rent or buy in the area and assistance with removal expenses is provided where necessary.

Anyone interested in this position, please write to: The Industrial Relations Manager, giving full details, or telephone (Glenrothes 753811, Extension 36) for an application form.

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Queensgate, Glenrothes, Fife, Scotland

LONDON BOROUGH  
OF BARKING

Borough Treasurer's Department

**Computer Manager**

(Male / Female)

Grade PO1(C), salary £8003-£8654 inclusive plus earnings related supplement.

Applications are invited from suitably experienced persons able to communicate and motivate staff. The Council has an IBM 370/128 computer with 2 disc drives and 2 tape drives using RPG, and the ability to make full use of this installation together with the development and implementation of new systems and procedures is required.

Application forms from Borough Treasurer, Civic Centre, Ockendon, Essex. Telephone: 01-582 4500. Closing date 28th October, 1977.

**MEMO**

To TRAINING OFFICERS  
Subject CORAL 66 COURSES

*The next Systems Designers  
CORAL 66 training course is on*

\* *5th December in Farnborough Hants.  
Cost: £190.*

*One week intensive course produces effective  
CORAL programmers through the use of  
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*Details from Corinne Rixon  
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**PROGRAMMER  
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c. £4250 per annum

Meyer Dumore International is a manufacturing company supplying machinery to the packaging industry.

The Company now needs a programmer to join its small Data Processing Department. He or she will work closely with the D.P.M. and be responsible for the running of the department in his absence.

Applicants should have at least 18 months' experience using RPG II in a commercial environment. A knowledge of IBM System 3 equipment would be preferred. The ability to work with minimum supervision and an open-minded attitude to one's work are essential.

Company Benefits include: four weeks' annual holiday, pension scheme, free life cover, subsidised canteen, and parking facilities.

For further details and application form, please contact:

The Personnel Department  
Meyer Dumore International Ltd.  
Abbey Road, Park Royal  
London NW10 7RD  
(Telephone 01-988 4021)

**SITUATIONS WANTED  
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(HND in Computer Studies with Distinction) seeks suitable positions abroad. Thorough knowledge of COBOL, PLAN, FORTRAN, BASIC, FND and FILE-TAB. Experience on 64K ICL 1902T operating under GEORGE II and MAXIMOP. Also have recognised commercial/management qualification and experience.

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Computer Weekly

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LECTURER  
in DATA PROCESSING**

Salary £12,000 - £14,000 p.a.

To each day responsible for the  
Analysis of the data processing  
systems of the polytechnic and  
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Further details and application  
form may be obtained from  
the Lecturer in Data Processing  
Department of Management  
Studies and Computing  
Oxford Polytechnic  
Oxford OX4 1JF

# OUTSTANDING OPPORTUNITIES FOR IBM TRAINED 370 CUSTOMER ENGINEERS AND SOFTWARE SPECIALISTS THROUGHOUT EUROPE OR IN A MOBILE INTERNATIONAL SUPPORT GROUP

We consider our client to be the world's leading supplier of IBM Compatible Mainframes. Their very considerable success in Europe, coupled with a business climate in which almost all large IBM computer users are evaluating alternative mainframes has generated significant career opportunities based in the U.K. - FRANCE - GERMANY - BENELUX - ITALY. Additionally there are appointments available in the International Support Group.

TO IBM TRAINED customer engineers and programming support representatives the positions will offer considerably more than enhanced income for example:-

**Security**

Security because of firm job contracts, the company's exceptional success, an acknowledged superior product line, a commitment to excellence, increasing investment, and a superb profit record - which is perhaps the greatest security.

**Pension and Fringe Benefits**

The company is experienced operating in Europe and knows the importance of pensions and fringe benefits in the European environment. It also recognises the Tax Advantages that are available to U.K. based personnel working overseas.

**Career Progression**

Because of our client's exceptional growth rate you are likely to achieve the more senior positions which you merit very much faster than with your present organisation. Some Key Senior Positions are available now.

**Training**

The company recognises that their greatest investment is in their people. Professional training safeguards this investment and ensures that you stay ahead technically and professionally. Training is carried out in both the United States and Europe.

**Salary and Income**

We are talking of positions throughout Europe and salaries vary considerably. The chances are you can make a very meaningful salary jump for example:-

**Customer Engineers and Programming Support Representatives**

U.K.

£8,000 - £11,000

Germany/France/International Support Group

£14,000 - £18,000

**Plus fringe benefits**

Certain key positions could attract even higher salary levels

**Your experience and abilities****Customer Engineers Ref - CE**

Large 370 CPU maintenance.  
Diagnostic expertise VSI-SVS-VM-MVS.

Customer communication ability.

Ability to work effectively with marketing and systems engineering, in the development of the business.

For the European positions you should be flexible, able to travel and preferably with a knowledge of another European language additional to English.

To applicants with relevant experience there are no Restrictions - Relocation Expenses will be Paid.

You owe it to your family and yourself to examine these opportunities. Call now, by telephoning (reverse charges) or send your résumé to the address shown below, quoting reference.

You can do this in total confidence - That's our business.

Interviews will be held throughout Europe - Calls can be taken in German, Italian, French, Telephone 01-540 8311.

After 7 p.m. your call will be recorded.



DPSC Group Limited, Crown House, Morden,  
Surrey, SM4 6BU. Telephone: 01-540 8311

International Recruitment and Search  
Consultants to the Computer Industry

Ref 11/12/77



# JOHN GOLDSMITH OPENS LOTS OF DOORS FOR KEY COMPUTER PEOPLE

**U.K. & Overseas opportunities for Operators, Programmers, Analyst Programmers, Analysts, Software & Hardware Specialists.**

Each week hundreds of top class computer vacancies are filled without ever being advertised. If you're a computer professional can you afford to go on missing some of the most important career opportunities in the business!

Whatever your speciality, whatever your level of experience, John Goldsmith Computer Recruitment Ltd., can open new doors for your career.

We undertake major assignments for some of the biggest names in commerce, major users, bureaux and manufacturers both in the UK and overseas. They use us because we have a big reputation to maintain — a reputation for professional service. They use us because we deliver the goods! We have filled over 26 overseas positions in the last six months alone.

We are dedicated to bring together the best people and the best jobs in the computing industry today. We employ only professional DP experts as our interviewers, people who fully understand their assignments and the interests, abilities, and motivations of YOU the candidate.

We are anxious to help computer professionals at all levels and in all areas. If you're the type of careerist who wants to make more of your potential, why not fill in the confidential reply form overleaf and post it to us — or better still ask us for an interview.

We will assess your skills and experience and match them to the most suitable opportunities on our books. And you can be absolutely sure that we will contact you before forwarding your details to our client — however many times we have to do so.

That's the essential John Goldsmith touch, personal, professional, completely confidential, but then, it's the sort of service you would expect from Britain's best qualified and fastest growing computer selection company.

You will see from our advertisements in Computer Weekly this week that the range of jobs we are advertising covers a very wide area of the computer field. We have many more jobs which we have not advertised and we are constantly being advised by users of new opportunities. We are always pleased to meet people and discuss their career opportunities, we don't work as a 'paper factory', we believe seriously that the individual is the most important product we have. You will always receive a welcome if you come to visit us, please don't hesitate to call us if you are looking for a job, or if you are looking for staff. We would be delighted to talk to you without any obligation.

# U.K. OPPORTUNITIES

## Challenging Opportunities to move into Sales

Full training given

London based

Are you ambitious, self-motivated and confident enough to join an expanding subsidiary of a multi-million pound group? Would you be happy in a fast moving sales position, involving some travel throughout the United Kingdom? Our client is a well established computer services company, currently looking for two people with these rather special personal qualities, who feel they would enjoy and operate effectively in this environment.

### Software Package Implementation

Salary up to £4,000 p.a. + Commission

You will be a Graduate with about 1 year's commercial background, ideally with relevant experience. You will initially be working closely with the Sales Manager on the implementation of Software packages and assisting in all aspects of post sales support, including customer training and demonstrations.  
Ref. 795A.

### Commercial Systems

Salary up to £5,500 p.a. + Commission

This position will be of considerable interest to a Graduate or otherwise suitably qualified person, with about 4 years' experience of implementing Financial Accounting systems, who is now interested in directing this knowledge towards sales.

Ref. 795B.

For both these positions, it is envisaged that within a period of 9 months to 1 year, the successful candidates will have gained sufficient knowledge and expertise to move into FULL-TIME Sales. Expected commission would range from between £3,000 p.a.-£6,000 p.a.

## Opportunity for a Programmer to move immediately into Systems Analysis

LONDON/ESSEX BORDER

SALARY up to £5000 pa

A leading insurance broker is now offering immediate training to a programmer, wishing to develop a career in systems analysis.

Applicants should preferably have commercial programming experience obtained in an IBM 360/370 installation, and have

reached the level of either Senior Programmer or Analyst/Programmer. If you have this background and the ability to liaise with users, you will be making a major contribution to the successful development of a large accounting system.  
Ref. 011.

## Analyst/Programmer Cotswolds

Salary up to £5000 per annum plus full relocation expenses

An Analyst/Programmer is required to work in this scenic area of England for part of an International Group.

Successful applicants will have 1-2 years' commercial systems experience, coupled with 2 years' RPG II experience, but for those

with other high level languages, full training will be given. This is an excellent opportunity for someone wanting to live in a rural area and gain valuable experience on a wide range of Accounting/Manufacturing systems.  
Ref. 351.

## Senior Analyst/Programmers for European Systems

BASIC SALARY up to £6500 pa

TOTAL PACKAGE up to £7000 pa

A sound manufacturing/commercial systems background and RPG II programming experience will give you the opportunity to develop your potential in a stimulating environment engaged on European systems development.

Our client, an international organisation with worldwide marketing interests, have established computer systems in numerous overseas locations based on either IBM System 3 or System 32 hardware.

All systems are developed/controlled by a central team at their UK Data Centre,

located in central Southern England close to the South Coast.

They are now seeking Senior Analyst/Programmers who have seen at least one major project through to implementation, who really enjoy complete involvement in all aspects of systems development and have the ability to hold project responsibility.

If you can show that you have these qualities then you could be earning a total package worth up to £7000 pa in the very near future. In addition, there are discounts on company products and generous relocation expenses.  
Ref. 822.

## Sales Support Analyst for COM Services

Central London

Salary up to £5000 pa plus

Substantial benefits including mortgage subsidy

A vacancy has arisen within the COM Division of an established computer services organisation for a Sales Support Analyst.

This position carries a wide range of responsibilities including proposals, presentations and sound technical support.

Applicants should have at least 2 1/2 years' commercial programming

and systems experience, and the ability to liaise effectively with customers and interpret user requirements.

Our client offers a range of generous benefits, including housing subsidies, holiday supplements, interest free season ticket loans, non-contributory pension scheme and BUPA.  
Ref. 821.

WE ARE ALWAYS INTERESTED IN HELPING YOU WITH YOUR CAREER

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John Goldsmith







# OPPORTUNITIES IN GERMANY CHARTERPORT

We represent a major German consultant who seeks top personnel. Several openings exist for highly skilled and motivated people with a positive and creative attitude.

## SOFTWARE EXPERTS SYSTEMS ANALYSTS SYSTEMS PROGRAMMERS APPLICATION PROGRAMMERS

Knowledge and experience is looked for in the following fields:

Systems Software of IBM and/or English Electric, DB/DC-Systems, first rate knowledge of at least two of the following languages: COBOL/RPG/PL-1/Ass, at least one of the operating systems OS/DOS/4J, familiarity with modern design techniques, experience with the management and implementation of large projects, experience with commercial applications and standard packages.

Education: Academic degrees are welcome, but professional skills and experience are essential.

Advancement to project management and management jobs will be offered to suitably qualified people after a period of resettlement in Cologne or Munich. A knowledge of German is preferred but candidates willing to learn the language will be considered.

Salary £9,000-£15,000

Apply for application form to: Shaun de Warren, Charterport, 91 Drayton Gardens, London SW10 9QU.

### ANALYSTS & PROGRAMMERS

## We've come a long way since then.

Wondrous though the business seemed in 1922, when the BBC first began radio broadcasts, our industry was of course, in its infancy. But progress has been rapid. Today, we have a dynamic, technological and creative corporation, evidence of which can be viewed daily, in colour, on that complex piece of equipment in your living room.



Find out just how far, at our next informal interview.

And as with many other contemporary operations, the computer has come to play a major role. With the BBC Computer Unit there are wide ranging applications in television, radio, engineering and finance, and now, we need more young analysts and programmers to help us develop new TP, on-line and data base systems for our ICL 2960.

You'd be working in Central or West London, but we'd like a chance to talk with you first, on:

MONDAY, 17th OCTOBER, between 5pm-8pm at BBC, 252 Western Avenue, Acton, W3 (Gipsy Corner - nearest tube station North Acton).

We expect to meet young people of outstanding potential. And we can promise that you'll get a very clear picture of our career opportunities. (New salary increases are effective from 1st October 1977.)

If you can't make it, please write to: Appointments Department, BBC, Broadcasting House, London W1A 1AA quoting reference 77 G. 497 / CW3 or phone 01-743 8000, ext. 4752.



## Computer Engineers New Zealand

Control Data, one of the world's leading manufacturers of IBM plug compatible equipment has a requirement for experienced Computer Engineers to join field teams in Auckland and Wellington, New Zealand.

Control Data's requirements are Minimum of three years Computer Engineering experience, preferably on IBM 360 and 370 mainframes, magnetic tapes, printers and discs. We offer: Salaries in the range of 9,000 New Zealand dollars to 14,000 New Zealand dollars depending on experience (approx. £5,027 to £7,821). Payment of reasonable relocation costs for successful applicants and their families. Assistance with accommodation on arrival.

Four weeks annual leave. Income insurance scheme. Immediate entry to superannuation scheme. Six monthly merit reviews. Final interviews will be conducted in London late October by a representative from Control Data New Zealand. You should contact Diana Seligmann 01-572 3411 for an application form or write to her at: Control Data Limited, Green Lane, Hounslow, Middlesex TW4 6BL.



## Operations Manager

North of England

Circa £8,000

An opportunity occurs for a young, dedicated and truly professional DP person to join a dynamic, progressive management team, controlling a very large mainframe site.

The incumbent, aged 25 to 35, must offer a strong operations background (preferably based on ICL equipment), energy, enthusiasm and proven man management capabilities with ability to motivate and control over 50 staff, including union members requiring negotiating diplomacy.

A wide technical appreciation of hardware/software maintainability is expected within their respective environments to enable judgements to be made on advice and recommendations from experts. He/she will be able to distil from detailed technical requirements, precise management objectives, optimising resources with regard to daily logistics. The demands of user and development departments must be met, necessitating a close and understanding relationship with supporting services.

This position requires a flexible and hard-working approach, but the potential career rewards are high. The size of the organisation provides definite possibilities in senior management. Benefits normally associated with such an opening are available, including generous assistance with relocation expenses.

Please contact MANCHESTER office (24-hour Ansaphone) for an application form or apply in writing quoting ref: CW58-7M.

01-588 8883 (24 HOUR ANSAPHONE)  
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061-236 2419 PAULKNER HOUSE  
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### Data Operations Controller

London W.1. c. £4400

If you already have some experience in data preparations, control, or remote batch operations, and now feel you would like to broaden your horizons, there could be just the job for you at Total Oil Marine.

We are looking for someone to supervise our small but vital Rediffon key to disc system, used with an IBM 370/135 to provide an 'on-line' service connecting our London and Aberdeen offices.

You will ensure that all data is prepared, controlled, despatched and collected according to schedule before submission via our remote batch facility.

This is an important and responsible post for which we are prepared to provide training.

Educated to at least 'A' level standard, you should have some previous data processing experience. Equally important, you should have a flexible attitude to your work, a meticulous eye for detail, and the ability to motivate others.

In return, we offer an attractive remuneration package, including bonus, BUPA membership, lunch vouchers, pension/health insurance, facilities and four week's holiday and the opportunity of working in modern pleasant surroundings.

If you are interested, please write or telephone: Mr. H. Newstead - Head of Recruitment and Training, Total Oil Marine Limited, Berkeley Square House, Berkeley Square, London W1X telephone 01-499 6080

# TOTAL OIL MARINE

Total Oil Marine is among the principal operators in the North Sea oil and gas industry. We're the UK production and exploration subsidiary of Compagnie Française des Pétroles, one of the world's largest oil companies.

### Abadan Institute of Technology, Iran

UNIVAC 1100/11

£9,000-£15,000  
TAX FREE + HOUSE

### Head of Software Applications Programmers

Abadan Institute of Technology have recently installed a UNIVAC 1100/11 computer and wish to form a Software and Applications section. Applications are invited from self motivated persons who should have a B.Sc., M.Sc. or Ph.D. in a scientific subject and experience with a high level language on a large computer. An opportunity will be given to the successful candidates to participate in the education of the students.

### Exec. Specialist

Applications are also invited from persons having extensive experience of the UNIVAC operating system who have the ability and confidence to be responsible for all aspects of low-level software.

Applications, stating clearly which positions are being sought, should be sent directly to the: President, Abadan Institute of Technology, Abadan, Iran.

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(Mini Computer Manufacturer)

Remuneration c£12,000p.a. + car, etc.

Our Client manufactures a fine range of computer products which are accepted in both the commercial and technical markets. This key position calls for a Marketing Professional to assume full responsibility for:

- \* product marketing
- \* product specification
- \* promotion
- \* marketing intelligence
- \* Market planning & direction

Candidates should offer:

- \* a developed understanding of marketing computer based products
- \* sales/sales management/sales related involvement
- \* a feeling for the smaller Company environment

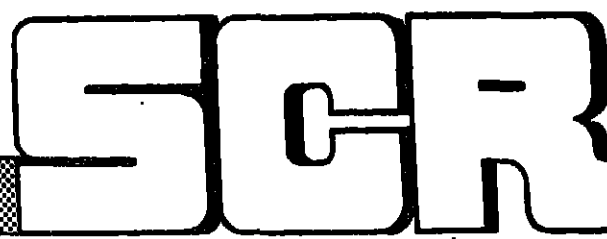
Substantial further career growth is possible to include a Board appointment within a foreseeable time-scale.

CONTACT: ADVISING CONSULTANT :  
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### SENIOR PROGRAMMER/ ANALYST

A vacancy exists in our Data Processing Department for an experienced Programmer to assist in the maintenance and development of commercial systems. The Company operates a Burroughs 5118. Applicants should be at least 25 years of age, have had 3 to 4 years' commercial data processing experience — preferably using RPG II and be of a mature personality enabling them to communicate with people at all levels. The Company is highly successful in its field of operations which entails the manufacture and supply of Educational Stationery and Teaching Aids. An attractive salary is offered for the post and the Company operates a staff restaurant and a Sports and Social Club. Applications, stating age and experience to date should be addressed to:

General Manager  
PHILIP & TACEY LIMITED  
North Way, Andover, Hants.  
Tel. Andover 61171 (0264)

### HERTS., BEDS. & BUCKS.

SYSTEMS ANALYST to £6,000

Experience of financial systems design required for on-line service applications development. Travel in the U.K. will be involved.

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Mini based equipment servicing experience preferably on PDP, required for Process Control systems. Car provided.

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Knowledge of Assembler and micro processor programming for process control applications. UK and European travel involved.

### VACANCY LIST

Free list of vacancies in Herts., Beds., Bucks. and North London areas.

Contact Roy Brackbury, St. Albans 61373

BLUE ARROW 0264 666666  
Blue Arrow House, 3 Holwell Hill, St. Albans, Herts.

## D.P.-Oriented Word Processing Sales

c.£5K + car + bonus - target earnings c.£8K

The product combines novelty with proven worth, the market's waiting to be developed, and the company has the name and financial strengths to make the most of both. We are creating an experienced young team to spearhead sales effort for a new VDU based word processing equipment. We are looking for knowledgeable marketing techniques learned during a computer-oriented career. Ideally, candidate will be late twenties, will have an educational function of at least 'A' level and will be able to show evidence of success in selling D.P. oriented office systems. They will be offered an exciting product, a London base and a remuneration package of up to £8K plus a bonus which includes a negotiable guarantee and should produce earnings c. £8K. Please write with full career details to Bill Rench.

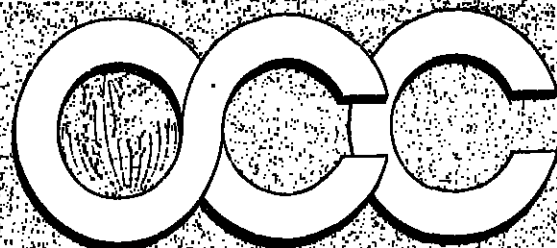
Applications, which may be from male or female candidates, will be treated in complete confidence and should quote reference 797/WJR.

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## occ computer personnel limited

### London

**Programming Consultants**  
£5,000 - £8,000

Excellent opportunities exist with a leading UK based software house operating on a world wide basis. The positions are permanent and can be based in London or Reading. Outstanding projects include:

- communications software development on ICL SYSTEM TEN and 1500 (SINGER 10 and 1500)
- operating systems and Database support on 2970s.
- an 8 month project in SURREY on a commercial account system for a 2903 (COBOL and RPGII).

We are looking for experienced software programmers as well as project leaders who have been responsible for the successful implementation of at least one project in one of the above mentioned fields. REAL TIME systems experience on MINIS or MAINFRAMES or a background in SOFTWARE DESIGN or OPERATING SYSTEMS would be relevant as well as a sound ASSEMBLER background. We need an experienced COBOL/RPGII person for the 2903 project.

Ref: 572/CW/Renée Nute

### Mitcham, Surrey

**Senior Programmers**  
£4,000 - £5,500

COBOL on any hardware required. B6700 bureau — TP and DB applications.

This bureau based on a Burroughs B6700, started life as the DP department of a major industrial group (annual turnover £70m). It has now been formed into a separate company and is actively promoting a profitable bureau operation, whilst meeting the data processing needs of the parent company. Several high calibre programmers are now required to develop a variety of commercial applications. They will join project teams of analysts and programmers and work from initial design through to implementation and support. On-line program development techniques are widely used.

Candidates should have at least 3 years COBOL programming experience on any large mainframe. These are unusual opportunities, since they give candidates the chance to become involved in setting up a new venture. There are good opportunities for programmers to move into systems analysis or more senior technical positions.

Ref: 728/CW Neville John

### Bermuda

**COBOL Programmer**  
£7,500 - £8,000 Tax Free

Our client is a thriving Bermudan bureau principally engaged in the development and installation of on-line computer systems for a variety of applications. They currently require an additional Programmer to supplement their existing team of Analysts and Programmers.

Candidates must have a minimum of 3 years' COBOL experience, preferably — but not essentially — including some time spent using Burroughs equipment. A knowledge of RPG and/or TP experience would be useful. The position will involve both in-house work and customer contact and candidates must therefore also have the professional approach and personality suited to working in a customer oriented environment.

Due to work permit regulations, we regret that only single candidates, or those married with no children, can be considered. Client interviews will be held in London in the near future, so for an initial discussion and application form please contact Sharon Matthews as soon as possible, quoting reference:

447/CW/SM

### COBOL Programmers

**Reading & London**  
to £7,000

Our client is a leading software house operating in the UK and overseas. Openings exist for all levels of programmers through to project managers, based in London or Reading. There are also possibilities of short and long term contracts overseas.

Candidates should have a minimum of 1 year's COBOL, preferably on 1900 or 2903 systems, although this is not essential. More senior positions would in addition require an in depth knowledge of development and implementation of commercial systems together with supervisory experience. Some of the programming vacancies would suit candidates who also have a good knowledge of Assembly language, whereas others would require experience with manufacturing applications. Further vacancies would be more suitable for candidates who also have RPGII experience.

The work will involve either in-house projects, dealing with the development of new application packages, or on-site assignments working on customers' projects. The right candidates will have the opportunity to train on new systems and to learn new languages.

Ref: 100/CW/Sandy Lloyd

**SALES & TRAINING MANAGEMENT**  
A leading international computer services organisation is looking for a person to fill the vacancy of **EUROPEAN SALES TRAINING MANAGER** based in London. This is a senior management position involving high quality and leading directly into sales, management and experience in sales is mandatory. Previous training experience in sales is desirable. The successful applicant will control his own budget and report through the European Manager to the Board.

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  - background of several years' commercial programming — ANY LANGUAGE, ANY MACHINE — and measurable analysis involvement
  - team leadership potential or experience
- Please ring us for a confidential discussion about how this appointment would match your aspirations and experience, quoting ref. 775D. Messages after hours will be recorded.

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London W1N 7FF  
Tel: 01-637 5796

Computer Centre — Barking Precinct  
Longbridge Road, Dagenham, Essex

The Computer Centre's ICL 1904S is used to run a batch assisted multi-access system based on MAXIMOP and GEORGE 20.

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£4630-£4900 (Ref: A 371/77)

To handle all aspects of substantial projects. The postholder will have a degree or equivalent and considerable experience.

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£3282 - £4507 (Ref: A 407/77)

To work with a team engaged in the production and/or implementation of a wide range of software packages. Consistent experience of programming in a scientific/technical language is necessary.

**COMPUTER ASSISTANT (C1/AP1/AP2)**  
£1838.34 - £4057.33 (Ref: A 402/77)

On a two-shift system covering 0800-2300. A training appointment is supported on the C1/AP1 part of this scale. Applicants must be 18+ and at least of 'C' level standard.

All starting salaries will be dependent on age, qualifications and experience.

For an application form and further details contact the Staff Personnel Officer, 100 The Grove, London E18 1BN (Tel: 01-559 0811 ext 83).

Closing date: 27th October, 1977

**NELP** North East London Polytechnic

## MOUNCEY & PARTNERS LIMITED

York House, Empire Way  
Wembley, Middlesex HA9 0PA

Descriptions are intended only as a brief outline of the experience we require which will, preferably, have been obtained in Financial, Commercial, Government or other environments.

### SENIOR CONSULTANTS

Management, Feasibility Studies, Systems Analysis, Computer Audits, etc.

### CONSULTANTS

Management responsibility, Systems Analysis, detailed design.

### TECHNICAL CONSULTANTS

Management experience, project responsibility, design.

### ANALYST/PROGRAMMERS

Experience as below plus some detailed systems spec. team/person management experience, etc.

### SENIOR PROGRAMMERS

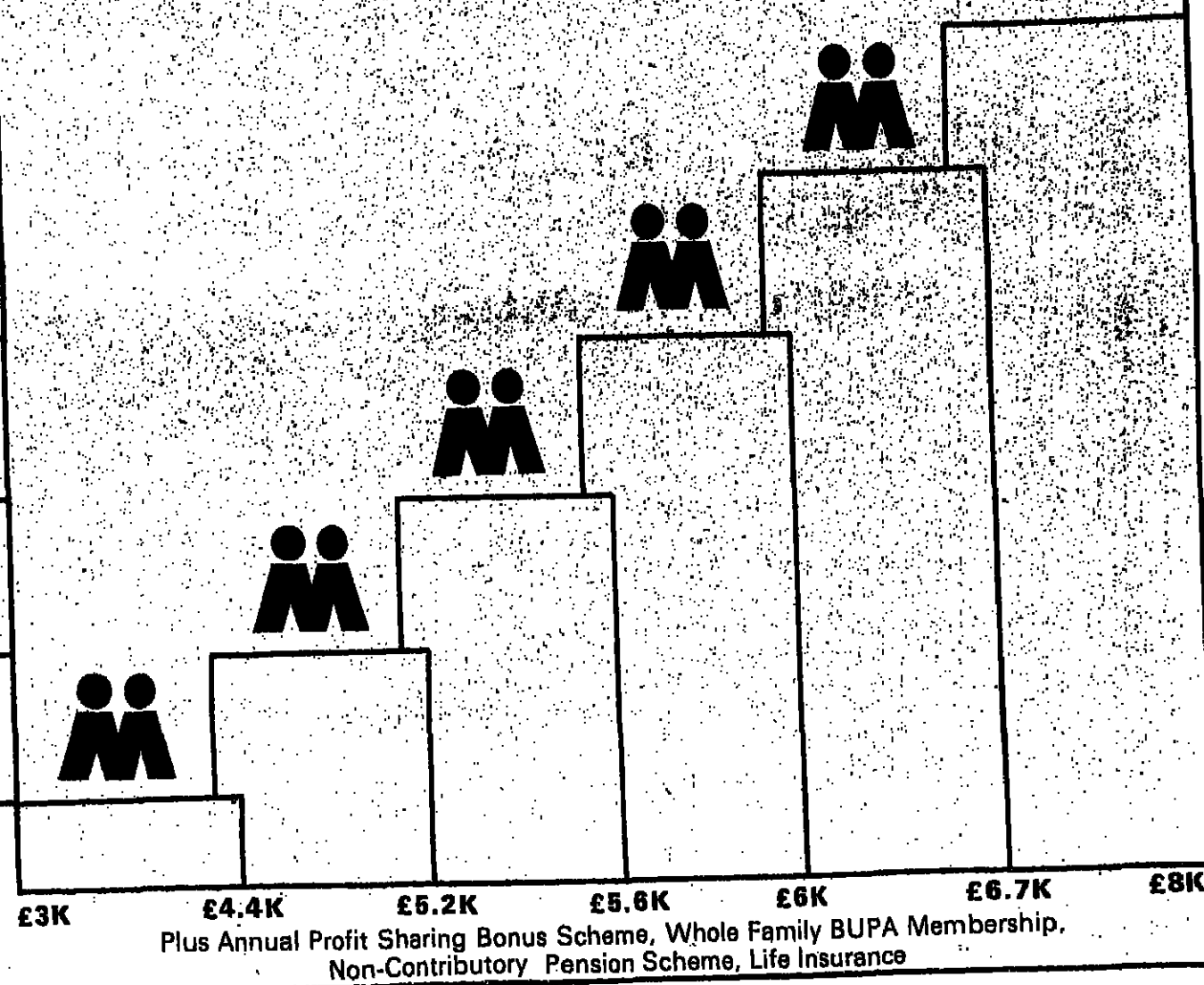
Experience of machines identified below and some experience in team leading, program spec. writing, etc.

### PROGRAMMERS

With programming experience of COBOL or ASSEMBLER on any of the following machines:  
ICL 1900's, ICL 1900, 2900's, ICL System 4's, Honeywell 6000's, NCR Century Range and Univac 1100 or 9030's.

## YOUR CHANCE TO STEP ON AND STEP UP!

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01-903 4901



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£5000-£5460 p.a.

+ valuable free travel on London Transport services at all times + good sports, social, restaurant facilities and pension. Running a transport system of the size, diversity and complexity of London Transport isn't just about buses and tubes. It's about a myriad of support functions like real estate, architecture, advertising, catering, engineering, signalling developments and so on. And it's therefore no surprise to discover that we've a large, fast expanding data processing department involved in a fascinating variety of work.

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- Two ICL 1904S and 2903/4 computers (using G2, G3, MOP, Maximop and ETS)
- IBM 370/145 using OS/VS1, CICS and DLI
- Realtime, on-line and batch systems
- Database Development
- Distributed processing
- COM
- Computer Typesetting

Career scope is excellent and there is always a high level of development work and a wide variety of applications.

Not only do we have vacancies for commercially oriented Analysts and Senior Programmers but in addition, we also require staff with a scientific/engineering background to play a major part in the development of advanced technical applications involving:

- Computer Aided Design
- Mini and microprocessors
- Real-time and process control techniques

Applicants will probably have at least an HND or similar qualification and where appropriate have extensive experience in the use of COBOL, FORTRAN, or CORAL 66.

Like to know more? Then call the Systems Manager on (01) 837 8144, or write to Staff Appointments and Development Officer (Ref: 278C), London Transport, 66 Broadway, SW1H 0BD.

LONDON TRANSPORT

## Systems and Programming Staff

**£5000 to £8000 PLUS • Profit Share**  
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Please telephone for an application form between 0830 and 1800 or write to: Colin Smith, CMG (City of London) Limited, Eastgate, 73 Leman Street, London E1 8EY 01-481 3881

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## Experienced Systems Analyst

To work on the design of an ADP system for a mobile multi-installation network. This involves an ability to interpret complicated User operational requirement and translate this into a system design, critically examining the benefits to the User of such a design and its options.

Candidates should have experience in computer systems design work preferably, but not necessarily, in a military environment and should have had practical experience in software design.

For further details write to Mrs. H. T. Payman, Marconi Space and Defence Systems Limited, Chobham Road, Fimley, Camberley, Surrey, quoting reference ES 43.

**Marconi Space & Defence Systems (Fimley)**  
A GEC-Marconi Electronic Company

## HOLLAND, THE HAGUE CYBER 173 PDP-11

SHAPE Technical Centre (a NATO research establishment) has vacancies on its international staff for:

## PROGRAMMERS

(Salary to 3,405 Dutch Guilders Net per month)

to design and implement software in the following areas:

- Simulations, data management, and statistical analysis of data bases on a large scientific computer. Applicants must be experienced FORTRAN programmers, preferably with experience of a simulation language, and a data base management system.
- Dedicated real-time systems and operating system software on mini-computers (PDP-11 primarily). Applicants must have experience in real-time applications and systems programming on mini-computers.

**QUALIFICATIONS:** GCE 'A' level, preferably to HNC. Grading depending on experience (at least one year required).

Applicants (NATO nationals only) should send a brief resume before November 15, 1977 to: Personnel Officer, SHAPE Technical Centre, PO Box 174, The Hague, Netherlands. Official working language at SHAPE Technical Centre is English.

## Arun District Council Systems Analyst

Grade AP5/SO1 £4343-£5085

The Council operates a Honeywell G2/40 mixed disc, tape and cassette, and require a Systems Analyst for all aspects of their work. Current applications include both financial and non-financial, and progressively the computer is being used for statistical analysis and assistance with management decisions.

Applicants must have two years' proven experience of systems for major projects and a background of Cobol. A knowledge of GLOS, or similar operating system (e.g. DOS/OS), is essential and preference will be given to candidates with local government experience. The ability to advise both management and programmers is desirable. Starting salary by agreement.

For an application form and further information including details of the Council's generous scheme of removal and resettlement allowances, contact the Manpower Officer, Arun District Council, Council Offices, Littlehampton, Sussex BN17 5EP (Tel. Littlehampton 6133, Ext. 318). Consideration would be given to provision of temporary housing accommodation in certain circumstances.

Closing date: 1st November, 1977.

## LONDON SCHOOL OF ECONOMICS RESEARCH OFFICER/ASSISTANT

Two posts. One to be responsible for the computing aspects of a project on retirement behaviour, the other to work on a project on income distribution and incentives — both in collaboration with other researchers and members of the Economics Department. Both jobs involve handling large survey data sets. Some statistics an advantage. To start wherever available. Appointment as Research Officer within range £3377-£6077 p.a. (including London Allowance) or Research Assistant within range £2396-£3510 p.a. (including London Allowance) depending on qualifications and experience. Applications to Miss P. Mounsey, Centre for Labour Economics, London School of Economics, Houghton Street, London WC2A 2AR (Tel: 01-405 7886) as soon as possible.

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CITY

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A high degree of personal project involvement; a young closely knit team of semi professionals; outstanding career opportunities; a commitment to a range of demanding applications in International Banking.  
Our Client, having rapidly developed an excellent reputation in the banking field are able to offer all the above.

They have an eye for:  
\* Outstanding and undeveloped potential, and specifically seek a background including:  
\* 2 years' financial applications experience.

The career rewards are obvious. The financial package is excellent, and includes 3% mortgage, annual bonus, personal and season-ticket loan scheme, non-contributory pension and a range of other large company benefits.  
It is envisaged that the Department will be re-locating to the Essex area by the end of 1978.

CW/10/6

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Freeport, Equity and Law House, 35-37 Great Charles Street, Birmingham B3 2BR

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**LONDON 01-935 0671 FREEPOST 6**  
Freeport 6, 102, Blandford Street, London W1E 1JZ

Computing  
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# SCR

## UNICOM

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- Modelling Languages for Mathematical Programming
- Statistical and Survey Analysis Systems
- Compiler Writing

Our clients include leading computer manufacturers and computer bureaux in this country.

We have developed a powerful machine independent modelling language (UMIP) User Interface to Mathematical Programming.

Please write to: Dr. G. Mitra, UNICOM Consultants Ltd., 108 Kew Road, Richmond, Surrey. 01-840 7716/77.

We are looking for young graduates with formal training in computer science, mathematics or related disciplines

- to join a team to maintain, support and enhance our product, UMIP
- to join a team to develop a new mathematical programming system.

Preferred age group is 22+ years; we offer a salary in the range of £3,000-£4,000 (or more for suitable candidates), and positive plans for career promotion.

Persons with appropriate experience who wish to have part-time employment may also apply.

We offer a relaxed working environment and we are looking for persons with commitment and good team spirit.

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ANALYSTS £4,500/£5,000  
ANALYST/PROGRAMMERS £4,000/£5,300  
PROGRAMMERS £3,800/£5,500

Haymarket Computing act as a DP recruitment consultancy to 36 companies in the Herts/North London area and we are currently anxious to interview on behalf of clients located in Stanmore, Potters Bar, Hoddeston, Edmonton, Enfield and Wembley.

Applicants will be invited to look through our client register which details the companies, positions, salaries, prospects, etc., so that we may jointly choose the vacancies best suited to your requirements and experience.

For more information ring:  
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Tel. Cuffley (Herts.) 4130  
up to 7.00 p.m.



# Burroughs

T.I.O. TECHNICAL INFORMATION ORGANISATION is an important support division of Burroughs. Headquartered in the London area — at Croydon — T.I.O. provides world-wide opportunities for involvement at all levels in the marketing support of products and is the link between our engineering and manufacturing facilities and our world-wide marketing organisation.

T.I.O. needs people who need a world-wide challenge either from a desk at headquarters, an office elsewhere in the U.K. or Europe, or 'in the field' — wherever the need arises — WORLD-WIDE.

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To join a team involved in the support of sophisticated systems software including Generators, Compilers, Interpreters and Utilities on brand new fourth generation computer systems, and intelligent terminals.

The successful candidate will be required to provide world-wide support and will become an acknowledged authority.

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Burroughs is moving very fast and so do the people who work for us. The challenge is there. The rewards are great.

If you can see an opportunity, write to P. Taylor or phone him on 01-686 0355. The address is Burroughs Machines Ltd. Technical Information Organisation, 512 Purley Way, Croydon, Surrey, CR0 4NZ.

World-Wide  
Career  
Opportunities



# Burroughs

We're not offering you a job. We're offering you a future.

## Training Role in Commercial Software Applications

The development of a new range of software for our client's range of minicomputers has created a new and advanced concept in languages and technology. Your main task will be to ensure that all their software support personnel are constantly updated and trained on new systems and applications whilst keeping a close brief on the company's future marketing objectives.

You should have a sound appreciation of minicomputers/business systems and how they relate to user problems across varied commercial disciplines. Previous training/instruction experience in the data processing field would be an obvious advantage. This position would suit a professional systems

man or woman who is looking for a more influential role within an expanding marketing unit. Salary is negotiable up to £6,000 plus mileage and car allowance and interest free car loan. Relocation expenses are available to the pleasant country location in the South East. (Ref: SB806CW)

REPLIES will be forwarded direct, unopened and in confidence to the client unless addressed to our Security Manager listing companies to which they may not be sent. They should include comprehensive career details, not refer to previous correspondence with PA and quote the reference on the envelope.

## PA Advertising

Hyde Park House, 60a Knightsbridge, London SW1X 7LE. Tel: 01-235 6040 Telex: 2787



A member of PA International

## Computer Services Unit Programmer/Analyst

£1,808-£4,515 (includes supplements) depending on age, qualifications and experience

Applicants should be educated to a level of either Computer Science Degree or HND/HNC standard in computer subjects. The successful applicant will be engaged on the design and implementation of both batch and teleprocessing systems and a good working knowledge of ANS COBOL is essential. Experience of IBM OS/VS1 and CICS will be advantageous.

The central installation comprises an IBM 370/145 (S12K), with 3330 disc drives which is to be replaced by a 1 Mbyte 370/148 in the autumn of 1977. In addition the County provides all computer facilities to the four District Councils in the area via remote VDU's and RJE terminals attached to 2 x 370's communication controllers. It is anticipated that over the next three years the number of terminals installed will reach 90 and a twin CPU configuration will be used to support them.

In approved cases, financial assistance with the removal of household effects will be available. Temporary housing accommodation for married couples may be available in approved cases, within the County area.

Applications forms from The Director of Computer Services, 5th Floor, Reds House, 87 Corporation Road, Middlesbrough, Cleveland or Phone: 0642 248166 Ext. 2351

Closing date 28th October 1977

# AJK CONSULTANTS LTD APPOINTMENTS DIVISION

TEL. 01-402 0933

We are not big but we try harder.

Because we are not big, we are able to offer a personal service to client and applicant. For the client this means getting to know the installation, the offices, the people and the problems. Then selecting, not by computer, only those applicants suited to match all these factors, and the job requirements, of course, thus saving our clients time and money.

For the applicant, the completion of one application form opens the door to a potential interview with many clients. Because we know our clients, we can save applicants time and give them much more information about the company they could be working for.

## SYSTEMS ANALYST WEST OF LONDON

c. £5,500 + Low Mortgage

Our client is a large IBM user, running batch and T.P. work under DOS/VS. They are seeking persons with at least three years' experience and a programming background and would prefer 'A' level education or equivalent. He/she will be expected to implement systems and lead others in programming and systems activities. Subsidised restaurant, sports and social club and RELOCATION EXPENSES are also offered.  
Contact: Brian Raine.

## SENIOR PROGRAMMER LONDON Up to £5,700 + Profit Sharing

Our client operates an IBM 370/135 under DOS/VS, using COBOL and ASSEMBLER. Applicants should have two years' experience and a financial background would be an asset. Excellent fringe benefits are offered including LOW MORTGAGE, FREE PENSION AND LIFE ASSURANCE, PAID NATIONAL HEALTH, CHEAP LOANS, ETC.  
Contact: Brian Raine.

## PROJECT LEADER SW of LONDON £5,500 upwards

Our client operates a large Burroughs installation, with three mainframes and many remote intelligent terminals, under MPCV. Due to expansion, they need experienced people, not necessarily Burroughs, who can LEAD small project teams, doing systems and programming and meeting deadlines. Excellent promotional prospects and fringe benefits.

Contact: Brian Raine.

## HARDWARE SALESMAN HOME COUNTIES £5,000 Basic + Car

Our client is seeking a capable salesman with some experience in computer hardware sales. Expected earnings in excess of £7,000, with excellent employment conditions are offered. If you feel restricted by your present product or environment, or have a successful selling background in non-computer products, telephone to discuss this unique opportunity.

Contact: Steve Morpurgo.

Our consultants are here to help you. They will do everything possible to find you the job you want, and you will receive courteous advice and assistance with an honest valuation of your earnings potential. Interviews outside normal working hours will be gladly arranged.

26 Chilworth Street, London, W2. 01-402 0933  
After 5.15 p.m. either ring 01-402 6627, or if there is no reply — 01-402 0933 for  
Answerphone Service.

AJK CONSULTANTS  
APPOINTMENTS DIVISION

## SENIOR PROGRAMMER LONDON Up to £6,000

Our client has an IBM 370/158 running under OS.

They are seeking a programmer with 2-3 years' experience of ASSEMBLER or PL/1. REAL-TIME training will be given, and there will be some user contact.

Excellent working conditions, with NON-CONTRIBUTORY PENSION, life assurance and LVs, are offered.

Contact: Steve Morpurgo.

## PROGRAMMERS LONDON Up to £6,000

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More senior applicants would be expected to have a knowledge of DRIVER.

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Contact: Brian Raine.

DARTFORD  
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Computer Personnel Consultants

## SENIOR SYSTEMS ANALYST

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LONDON c £5,500

An excellent opportunity exists for an experienced PROGRAMMER or ANALYST/PROGRAMMER seeking additional responsibility and career progression within a technically challenging environment. The successful candidate will work within a small department initially developing a unique on-line system to give positive control of the company's production stocks and distribution. Applicants should have at least three years' programming experience and be keen to develop their analysis skills. A number of areas have been identified for computerisation and offer good career prospects. Conditions of employment are first-class and also include a company discount scheme.

## DEVELOPMENT PROJECTS

(Database and Communications)

W. LONDON

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ANALYST/PROGRAMMER To £5,750

These positions present an excellent opportunity for PROGRAMMERS or ANALYST/PROGRAMMERS, at all levels of seniority, now seeking to enhance their career in a progressive and challenging company offering outstanding potential to undertake complete projects. A number of applications are scheduled for implementation affording successful candidates the opportunity to gain extensive experience on systems using communications and database techniques. Applicants should have sound COBOL programming experience preferably gained using IBM or Univac equipment. They should have a flexible outlook and be able to function at all levels. Candidates for the senior positions should be capable of accepting project responsibility. The Company operates computing facilities on a world-wide basis and offers excellent conditions of employment including Non-Contributory Pension, LVs, Season Ticket Loans and Flexible Working Hours.

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S.W. LONDON

c £5,250

Analyst/Programmers with good COBOL experience are required to join a progressive department installing applications for a new ICL 2980 configuration. The successful candidates will work within project teams where they will be encouraged to develop their skills in analysis whilst gaining experience and training in large 2900 issues. A comprehensive plan of systems and programming activities has been established and the company offers a positive career path to the persons appointed. Excellent conditions of employment incorporate Flextime, LVs, 4 weeks' holiday and pension scheme.

Please telephone for a confidential discussion or write to:  
30 Fleet Street London EC4Y 1AA  
01-353 5868

## Senior Analyst/ Programmer

An International shipping group require a Senior Programmer with experience in system design to text existing manual system prior to actual computerisation, advise on purchase of new installation, and organise the changeover to a computer based company. The suitable applicant will possess D.P. experience in programming and systems design in a financial/transportation environment and preferably controlled the implementation of at least one major commercial system. The position will be based in London, salary is negotiable and will reflect ability experience and qualification but would not be less than £6,000 per annum.

Please write with full career history, quoting ref no. CW 1707 to the Security Manager, MCS Robertson & Scott Ltd., Friendly House, 21-24 Chiswell Street, London EC1Y 4UB.



MCS/Robertson & Scott

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Salary £4000-£6000 p.a.

Expanding UK branch of Data Communications Corporation requires flexible person with software background to perform system support role. Data General experience essential, knowledge of COBOL and/or communications an advantage.

Contact: Mrs. A. Trembeth  
Data Communications Corporation  
Thames House, 5 Church Street  
Twickenham, Middlesex TW1 3NU  
Tel: 01-892 9685

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Vacancies exist with a large petroleum company for two analyst/programmers to work on stimulating projects using an IBM 370/145 under OS.

Permanent employment is offered to experienced professionals who are able to satisfy the following pre-requisites:—

- 25 to 35 years of age
- male (marital status immaterial)
- a background of IBM mainframes and software
- at least 3 years' experience with PL/1 and one other language, preferably COBOL or BAL
- commercial systems experience gained in the petroleum industry would be an advantage

An extremely attractive, tax-free, financial package comprising salary, accommodation and benefits will be offered. Generous home leave with paid air fares will also be available.

Closing date for applications is 20th October, 1977.

Applications to:

**altergo**

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c £4,000

## PL/1 Programmer

The makers of G-Plan furniture are seeking a programmer with at least 18 months' PL/1 experience to join a small team.

The installation is a 370/125 operating under DOS/VS with POWER and we are currently implementing a trial T.P. Order Entry system under SHADOW/II.

The successful applicant will be expected to show considerable initiative and work with minimum supervision.

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# Duncan Bransom Recruitment

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Join a company that will help you develop  
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At UNILEVER COMPUTER SERVICES LTD. (UCSL), part of Unilever, one of the world's giant corporations, each individual is helped and encouraged in the development of his professional career.

### The Work

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The work load is expanding steadily hence the need for more people.

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Since the company is going to help you to develop into a senior data processing professional your actual entry point into the system is not particularly important. Your start point could be any of those listed below. At your interview the best entry point for you can be discussed and determined.

Junior programmer  
Programmer  
Senior Programmer  
Programmer (Time-sharing)  
Analyst/Programmer  
Systems Analyst  
Senior Systems Analyst  
Project Manager

### Programming Languages

Mainly Cobol, some PLI and Assembler, RAMIS, Easytrieve. For analysts some programming experience is desirable.

### Has it got to be I.B.M.?

Your previous experience does not necessarily have to be on IBM equipment but those applicants with significant IBM experience will be able to fit into the working environment more quickly. This will obviously give them an edge over those who have not.

### Further Information, Application Forms, Interviews

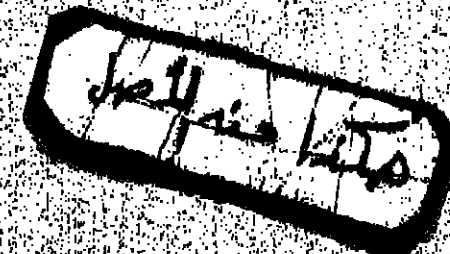
If you would like to be considered for one of these jobs or would simply like to talk about them, Roger Griffiths of Duncan Bransom Ltd. will be at UCSL's Head Office at Station House, Harrow Road, Wembley, Middlesex — telephone 01-903 1414. Why not drop in to see him or telephone him there any time on Friday, 14th October, or from Monday to Friday 17th-21st October, inclusive, between the hours of 8.00 am and 7.00 pm. Interviews can be arranged while you wait.

After the 21st October, please contact him at the Duncan Bransom office at 37 Hillcrest Road, Loughton, Essex, telephone 01-608 5121.

Please write or telephone for an application form to:  
Roger Griffiths, Duncan Bransom Ltd.  
37 Hillcrest Road, Loughton, Essex.  
Telephone: 01-608 5121



Duncan Bransom Limited





# Informatix UK & O'seas Index

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POSITION	SALARY	EMPLOYER	LOCATION	HARDWARE ENVIRONMENT	SOME OF THE QUALIFICATIONS	REF. NO.
Assembler Software Programmer	Dm. 48,000 + Car	Minicomputer Manufacturer	Southern Germany	Mini	Well grounded in Mini Software with substantial exp. of Assembler.	41/1
P/L/1 Applications Programmer	c. £5,000 + Mortgage	International Banking Corporation	East London & City	IBM 370/OS CICS & IMS	Sound PL/1 exp. essential; any exposure to CICS or IMS will be an advantage. Training given.	41/2
COBOL or PL/1 Analyst Programmer	c. £5,600 Overseas Travel	Software House	S.W. London	IBM OS/DOS	3-5 yrs. COBOL or PL/1 under either OS or DOS. Sound JCL and utilities exp., excellent career opportunity.	41/3
IMS Analyst Programmer	to £6,000 + Benefits	Management Services Facility	North London/Middx.	IBM 370/OS	IMS DB/DC exp. essential preferably using PL/1. COBOL possible alternative. Very professional O.P. dept.	41/4
IBM/H/Well COBOL Programmer	c. £5,000	Computer Manufacturer	Central London	Honeywell 2000	2 yrs. COBOL exp. on any mainframe, preferably IBM or H/Well. Small well run installation.	41/5
IMS Applications Programmer	To £5,500 + A1 Benefits	Management Services to Int'l Group	West London	IBM 370/MVS	2 yrs. + IMS DB/DC ideally using PL/1. One of the foremost installations in U.K.	41/6
Mini Analyst Programmer	C. £11,000 + Tax Allowance	International Systems & Software Group	Benelux	D.G. Interdata PDP etc.	Mini Software specialists and Communications/Message Switching exp. Urgently required.	41/7
Banking Analyst	to £8,000 + Mortgage	U.S. International Banking Group	City	IBM 370/DOS System 3	Very Senior post suiting a person with sound Banking background able to handle exacting tasks.	41/8
Systems Analyst	c. £5,750	Re-Insurance Group	Croydon	IBM 370/DOS/VS	Analysts with 2 yrs. + exp. ideally with DOS background; might suit Analyst Prog. with COBOL exp.	41/9
ICL COBOL/PLAN Applications Programmer	£4,500-£5,750	Banking	N.W. London/Middx.	ICL 1900/2900 MAXIMOP	2 yrs. + COBOL and/or Plan in ICL Environment. Good career prospects for right persons.	41/10
Univac/IBM COBOL Anal/Prog.	c. £5,100	Computer Bureau	Central London	Univac 1110	One of U.K.'s largest Comp. Bureau. Offers very challenging opportunity to COBOL Analyst Programmers.	41/11
Communications Specialists	c. £11,000 + Benefits	Major Int'l Software House	Belgium	Minis/M. Frames	Exp. of Telephone/Telex and/or Message Switching or General Communications.	41/12
IBM COBOL Programmer	c. £4,900 + Mortgage	Insurance	East Surrey	IBM 370/DOS/VS	One of the Major Insurance Cos. Plenty of scope to develop career. COBOL is essential.	41/13
Team Leader	c. £8,200	Major Manufacturing Group	N.W. London	ICL 1900/2900	Plan and/or COBOL in an ICL environment essential. Important post with development potential.	41/14
PL/1 or COBOL Sr. Analyst Programmer	£10,000-£14,000	International Systems and Bureau Group	Germany & Belgium	IBM 370/OS & System 4	Foremost Systems and Bureau Group. PL/1 and/or COBOL under OS essential. Foreign language required for some posts.	41/15
BAL Sr. Systems Programmer	£5,650 + A1 Benefits	Insurance	City	IBM 370/DOS/VS CICS	Mn. 2 yrs. BAL and 1 yr. DOS/VS. Gen. Higher education an advantage, any exposure to CICS desirable.	41/16
Compiler Development Programmer	£6,000 + Car	Computer Manufacturer	West Middx.	Minis	Sound Assembler exp. Compiler background essential, any basic knowledge of COBOL an added advantage.	41/17
PL/1 or COBOL Analyst Programmer	c. £6,500 + Travel Exp.	Software House	Central London	IBM 370/OS	Whilst PL/1 and/or COBOL are essential, willingness to travel on business extensively at times is the priority.	41/18
BAL Systems Programmer	c. £4,750 + Mortgage	Insurance	N.W. London/Middx.	IBM 370/DOS	Rapidly expanding D.P. dept. offers genuine advancement opportunities to right persons.	41/19
PL/1 CICS Programmer	c. £5,000 + Mortgage	Financial Institution	North London/Herts.	IBM 370/OS CICS	Senior PL/1 Programmers ideally with exposure to CICS will be enthused by these excellent posts.	41/20
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PL/1 & COBOL Programmer	c. £5,000 Mortgage	Banking Management Services Group	City	IBM 370/OS	Sound PL/1, COBOL or BAL exp. in OS environment. Solid grasp of JCL and IBM utilities. Good documentation standards vital.	41/22
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Applicants should be suitably experienced graduates. Application forms are available from the Personnel Services Officer, Severn Trent Water Authority, Upper Trent Division, Trinity Square, Harncliffe Street, Burton-on-Trent. Telephone: Burton 44511.

Closing date: 27th October, 1977.

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We have a number of companies in Surrey and Sussex looking for a programmer with ASSEMBLER programming experience. All companies have IBM 710 mainframes, offer excellent conditions of employment including good training, salaries and mortgage assistance. These of our clients are located in rural surroundings.

## COBOL PROGRAMMER CROYDON

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## ANALYSTS SURREY

to £6,500 + benefits

The high demand encountered in September for Systems Analysts in Surrey has continued into the month. At the time of writing, we have 15 vacancies based in Surrey all waiting to be filled by analysts and senior systems analysts. The companies range from financial, through retail to manufacturing interests and consequently it does not matter in which area your experience has been - we must have a vacancy that can interest you.

THESE ARE JUST A SMALL SELECTION OF OUR CURRENT VACANCIES. CONTACT US TO DISCUSS, WITHOUT OBLIGATION, ANY OF THE ABOVE...



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£4300-£5200

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Our client, a major engineering organisation with its headquarters in Glasgow, requires a Systems Analyst for their installation. Applicants should preferably have experience in production and inventory control systems. A strong, energetic personality is required.

In addition a programmer with a minimum of 3 years' experience (COBOL) is needed to join their professional programming section.

## ANALYST/PROGRAMMER

Our client, a major construction company, have an NCR Century and candidates should have experience of financial systems and programming (Nest 3) on a similar machine. Applicants should have the ability to lead a small team and take projects through from start to finish.

Relocation assistance is available for all these positions.

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New North Building, 102 New St, B2 4AD

BRISTOL (0272) 211035  
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If your experience is on ICL or IBM Mainframe, or any mini equipment, and you can program in COBOL, Plan, PL/1, Fortran or Assembler you qualify as an applicant.

Salaries range from £3500 to £5000 p.a. depending upon experience and position applied for. All are accompanied by the usual large company benefits and relocation expenses will be met in most cases.

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We have a £500 m turnover through our 850 outlets and employ 19000 staff in various parts of the country. We've just installed the Burroughs B4700 to supplement our existing B3700. We are making heavy investments in the distributed processing field. We are linking Depot computers throughout the country with Head Office and planning to replace existing hardware for on-line systems work.

We're searching out that rare, restless breed who realise now that computers are about to revolutionise retailing. Those innovators who are full of enthusiasm over what computers could be doing. The ideas people who can get excited at the prospect of helping us to plot a computerised supermarket retailing revolution.

Here's the chance to put your special stamp of computer talent on the Superstores of the future. We're offering a challenge and a creative computer approach all the way from management, purchasing stock control and distribution right through to point of sale.

You'll be needed to help us plan and polish our projects. To dream up and develop the details. To systemise new shortcuts. To research original routines and to perfect fresh procedures.

If you have experience of high level languages, database, data communications or a background in on-line or other commercial systems development, we want to meet you. We don't want a detailed job application from you. We're far more

interested in what you can do, and would like to do, than in what you've already done. We'd really like to swap ideas with you. Hear how you feel about following up some fresh lines in our computer thinking.

Financial rewards? Working conditions? Fringe benefits? Future prospects? Let's have an informal chat first. We think you'll agree then that everything about these challenging new posts is rather special.

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HENDON October 19th,  
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LEEDS October 19th,  
Merrion Hotel, Merrion Centre.

LUTON October 20th,  
Stratmore Hotel, Arndale Centre.

GLASGOW October 20th,  
MCS House, 23 Park Circus.

STEVENAGE October 21st,  
Roebuck Hotel, Old London Road.

Alternatively, if you can't make it, telephone or write to

C.L. Hopkins, Computer Services Manager  
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Tel: Andover 62188

Completed application forms should arrive  
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**TSB**

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Analyst position with 2-3 years' Cobol, IBM DOS background, for this company in London. WC2, Ref. 194

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#### SYSTEMS ANALYST

2-4 years' experience and some RPG II, for a position in London, N1 Ref.

#### ANALYST/PROGRAMMER

RPG II knowledge plus 3 years' analysis experience, to set up the system for a new installation, IBM S/VS 32, Surrey, Ref. 211.

#### SYSTEMS ANALYST

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To discuss these or our unadvertised appointments in more detail and in the strictest confidence, call X-Calibur on 01-363 8201/3 or write to 47 Essex Street, London WC2E 3JF.

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### COMPUTER AUDITING

Touche Ross & Co., Chartered Accountants, wish to recruit for two positions in their Computer Auditing Department, which is based in the London office.

#### TRAINING MANAGER

Up to £7,000

The work will cover the presentation of courses in the areas of computing, computer systems, and the firm's own software system, STRATA. There will also be an ongoing requirement to maintain and develop the existing courses to keep pace with relevant developments in computing. The recipients of this training include not only all levels of audit staff within the firm but also clients' internal audit and D.P. staff. Candidates should have experience in the following areas:

- financial systems design and implementation
- development and presentation of training courses
- working knowledge of at least one IBM operating system preferably O/S

#### TECHNICAL SUPPORT MANAGER

Up to £7,000

This is an interesting position for an experienced data processing professional since it involves advising specialist computer auditors and audit client personnel on the technical aspects of computing. This is an excellent opportunity to become involved in a wide variety of installations encompassing most important types of hardware and software. At the more detailed level there will also be prime responsibility, in the U.K., for the technical support of the firm's software system, STRATA, which is currently used on IBM and Burroughs hardware as part of the firm's normal audit procedures. Candidates should have experience in all the following areas:

- financial systems design and implementation
- programming in COBOL and Assembler
- working knowledge of at least one IBM operating system, preferably O/S

Both positions will report to the Partner in charge of Computer Auditing in the U.K. firm, and opportunities exist for travel to North America and Europe. Some knowledge of the audit of computer systems would be a considerable advantage, although the necessary training in this and STRATA will be provided. This will be supplemented by involvement in client work to gain the necessary practical experience.

Fringe benefits include the firm's car scheme, contributory pension scheme, free life insurance and disability schemes and four weeks' annual holiday.

Please apply for an application form to: A. T. Gardner-Brown, Touche Ross & Co., 3 London Wall Buildings, London EC2M 8PH. Tel: 01-688 3678.

#### CITY IBM SHIFT LEADER

Our client, a major financial organisation, require a Shift Leader with a minimum of 3 years' IBM 370 experience. The successful applicant will be responsible for the operation of the 370 system and will also be responsible for the operation of the 370 system and will also be responsible for the operation of the 370 system.

#### CITY ICL OPS/SHIFT LEADS

Applications are invited from operators with a good knowledge of background to join several progressive organisations, working on either a 2 or 4 shift system. Two of the Senior positions carry subsidised mortgage and other reasonable benefits.

#### S. LONDON IBM OPERATOR

An excellent opportunity exists for an operator with approximately 2 years' DOS/VS experience to work in a banking environment. The successful candidate will work on a mid-range IBM 370 within the banking system, on alternative hardware. Generous benefits include subsidised mortgage and personal loans.

#### N. LONDON ICL OPERATORS

We currently have a number of positions offering good prospects for responsible young people wishing to progress in computing.

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Must have management and project control ability, good motivating skills and strength of character. Technically good COBOL and JCL in an OS environment on 360/370 series.

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We offer a competitive salary; other fringe benefits include non-contributory pension scheme; subsidised restaurant and first class social/sports facilities.

Please write giving brief details of age, qualifications and experience, quoting reference PFCBE to: The Manager, Central Recruitment, The British Petroleum Company Limited, Britannia House, Moor Lane, London EC2Y 9BU. This appointment is open to men and women.

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Apply with details of career to date to:

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### SHEFFIELD CITY POLYTECHNIC

Department of Computer Services

#### COMPUTER AND SYSTEMS MANAGER

Salary Grade — Principal Lecturer  
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The successful applicant will be primarily responsible for managing the day to day computer services and will also co-ordinate the work of the systems programming team which is responsible for operational software maintenance and development.

The computer is an IBM 370/136, and offers both batch processing and interactive terminal services. The post requires a person with a sound personal computing background and an understanding of the range of needs in an educational environment.

Requests for an application form to be sent only please to the Personnel Department (Dept. CW), Sheffield City Polytechnic, Hallford House, Firsden Square, Sheffield, S1 2BB, to whom completed forms should be returned by November 4, 1977.

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